

DigiCall Correlator training guide

September 2009

Contents



Halma Water Management

1. Background to Leak Noise
2. Correlator Terminology & Principles
3. Basic on Site Setup
4. Charging
5. Menu Layout
6. Correlating
7. Interpreting Results
8. Functions (Filtering, Suppression, Reg Analysis, Vel Check etc)
9. Three Station Correlation
10. Upgrading
11. Sources of Error

Background to Leak Noise

Noise Sources



Halma Water Management

- Leakage
- Partial obstruction of pipe bore (foreign object)
- Consumption
- Pressure reducing valves (PRV's)
- Partially closed valves (throttled or passing)
- Close proximity of main to sewer/culvert pipe
- Changes in pipe diameter
- Water pumping
- Electrical interference
- Pipe lining

Leak Noise Quality



Halma Water Management

- **Important Factors**
 - **Clarity**
 - **Strength**

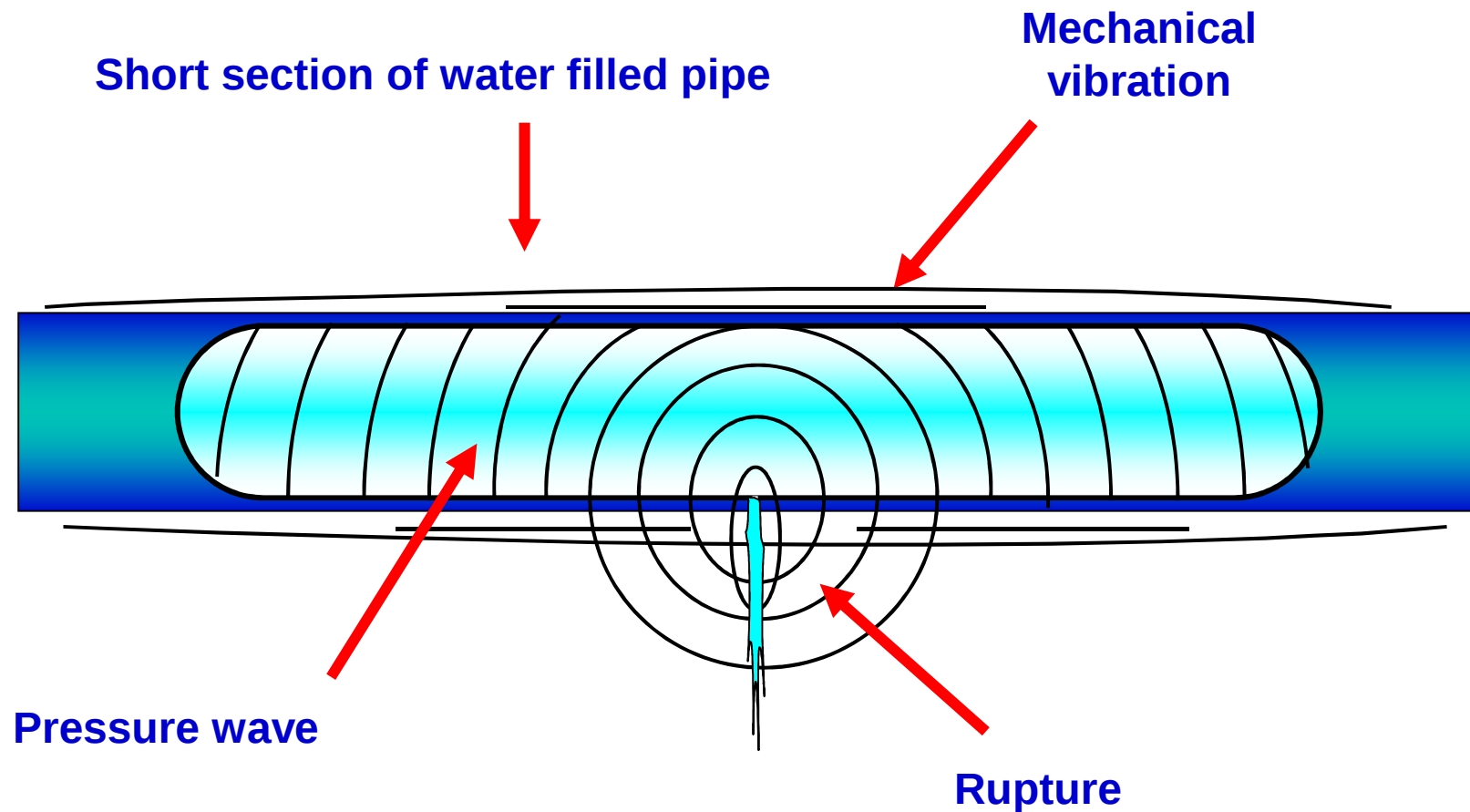
- **Good Leak Noise**
 - **Clear, light & easy to distinguish**
 - **Strong & easy to hear**

- **Poor Leak Noise**
 - **Dull, muffled & difficult to distinguish**
 - **Weak & difficult to hear**

Vibration and Pressure Wave



Halma Water Management

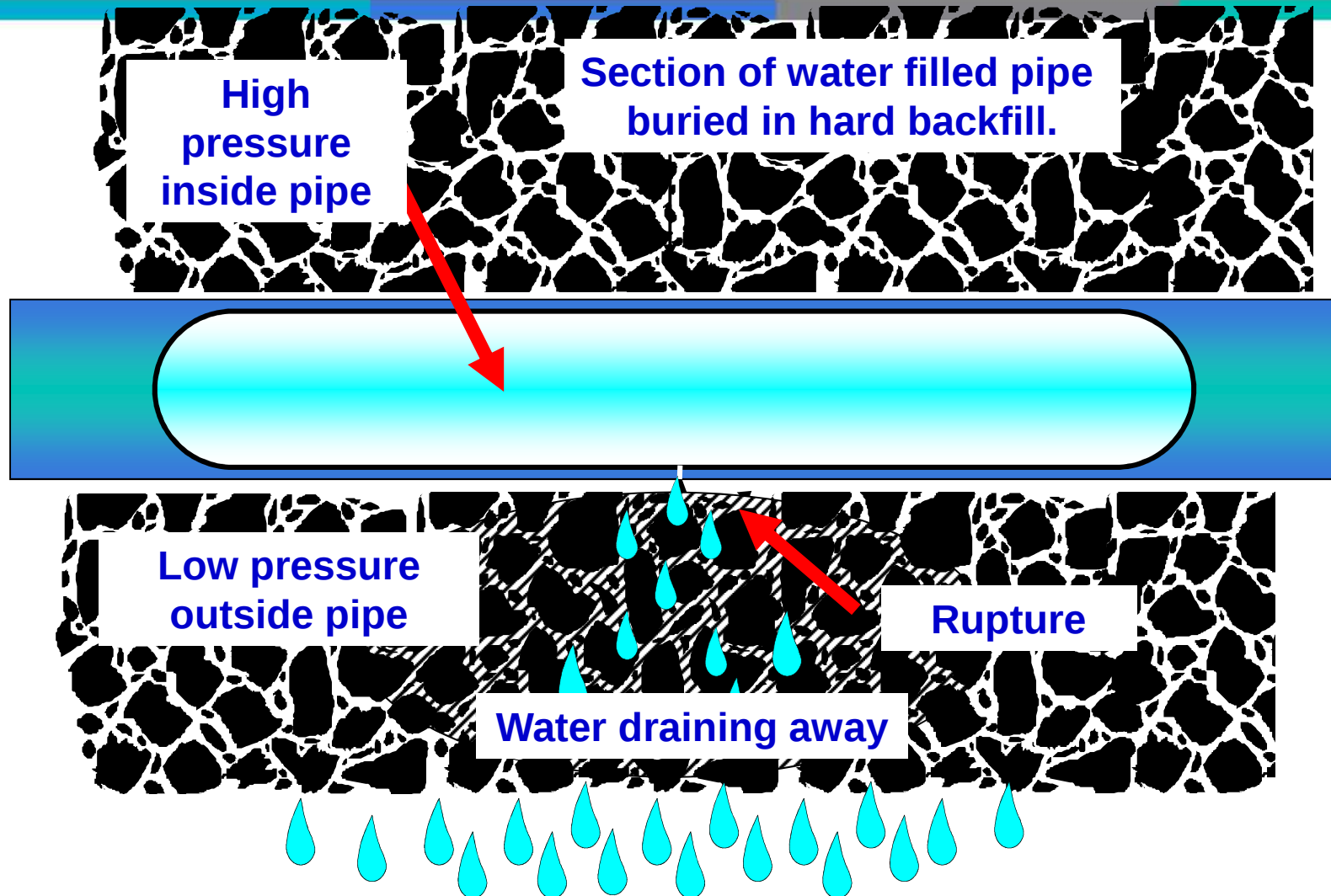


A HALMA COMPANY

Hard Backfill Diagram



Halma Water Management

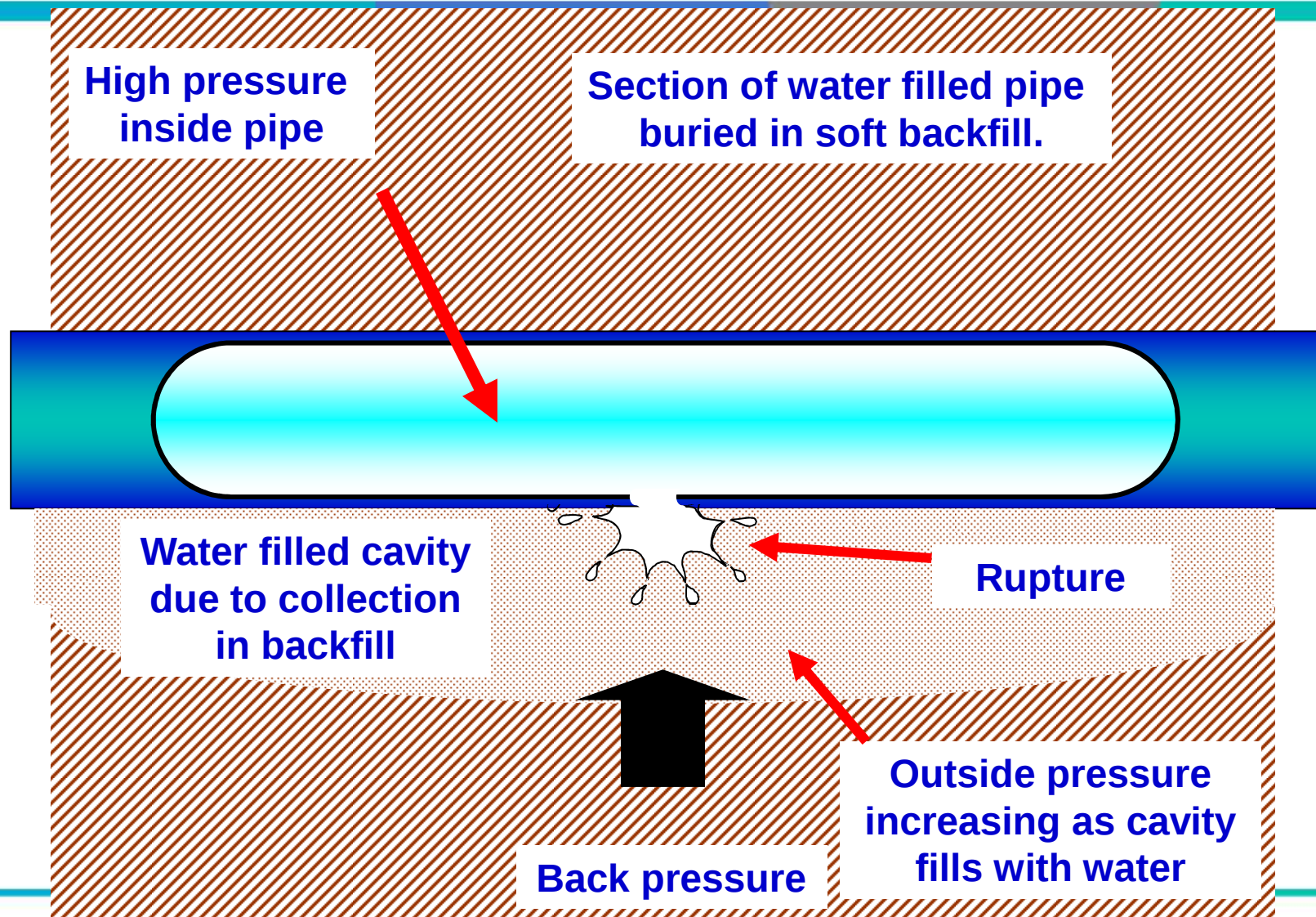


A HALMA COMPANY

Soft Backfill Diagram



Halma Water Management



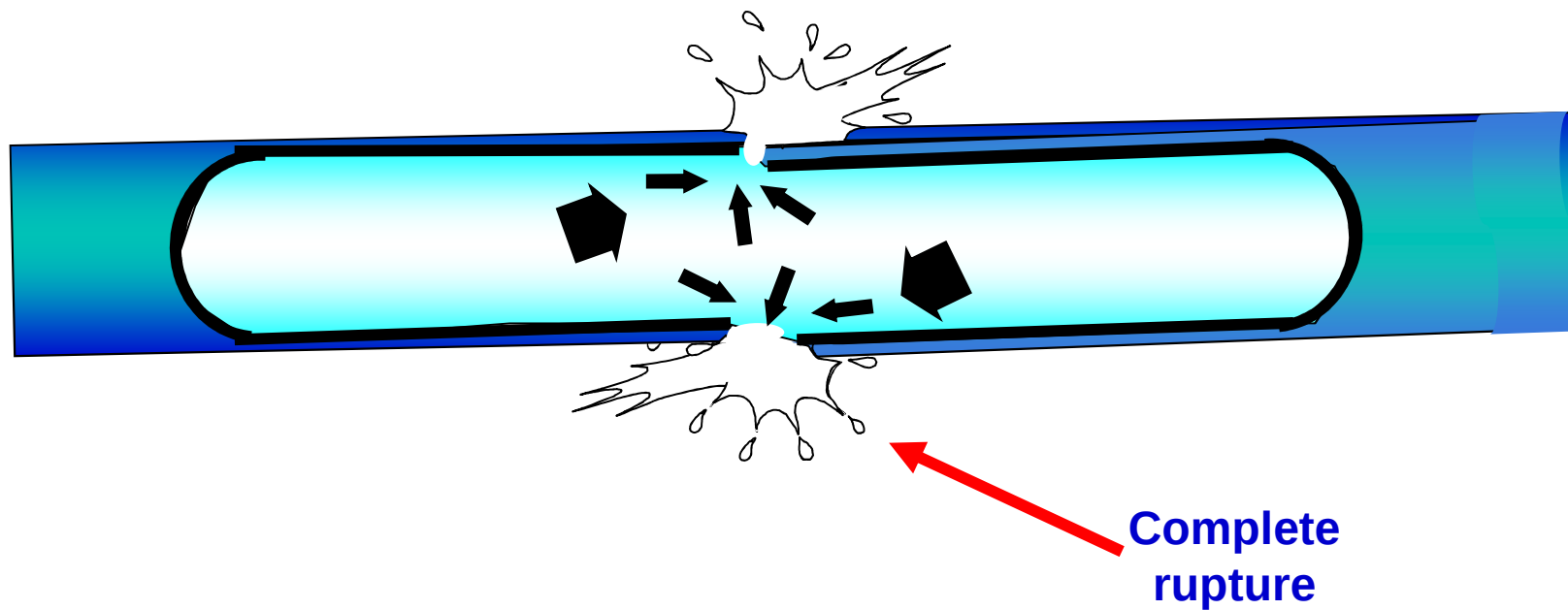
A HALMA COMPANY

Complete Rupture Diagram



Halma Water Management

Pressure within pipe is lost

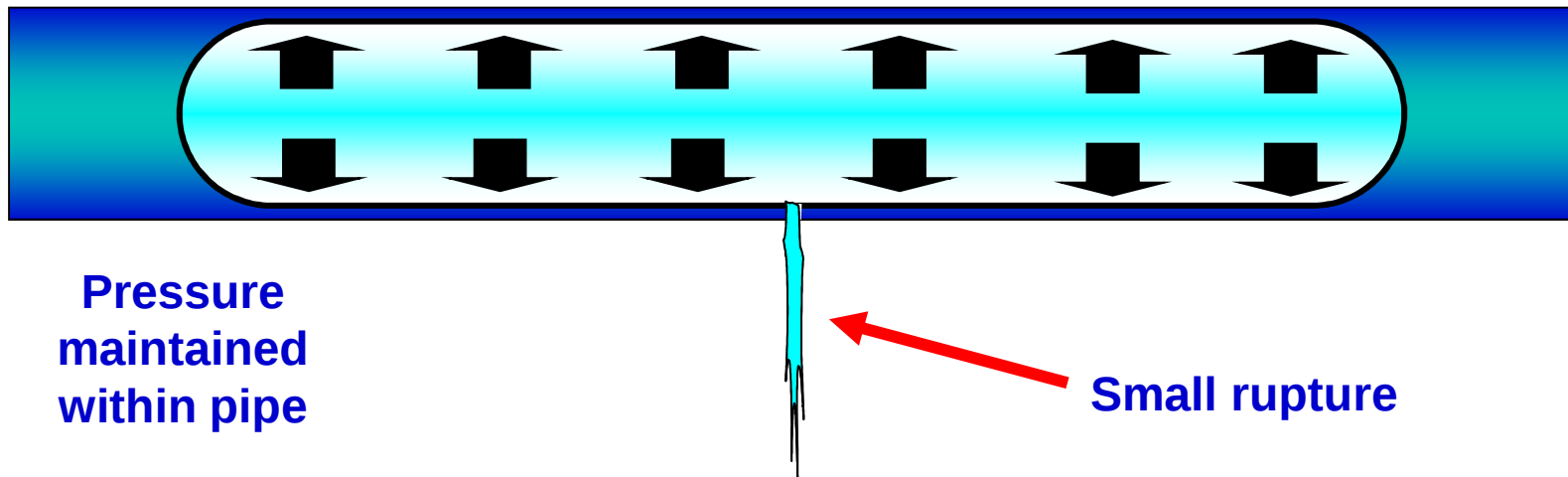


A HALMA COMPANY

Small Rupture Diagram



Halma Water Management



Pressure
maintained
within pipe

Small rupture

Material Types



Halma Water Management

- **Steel**
 - **Iron**
 - **Copper**
 - **Asbestos Cement**
 - **Lead**
 - **PVC**
 - **Polyethylene**
- **Hardest**
 - **Softest**

Leak Noise Factors



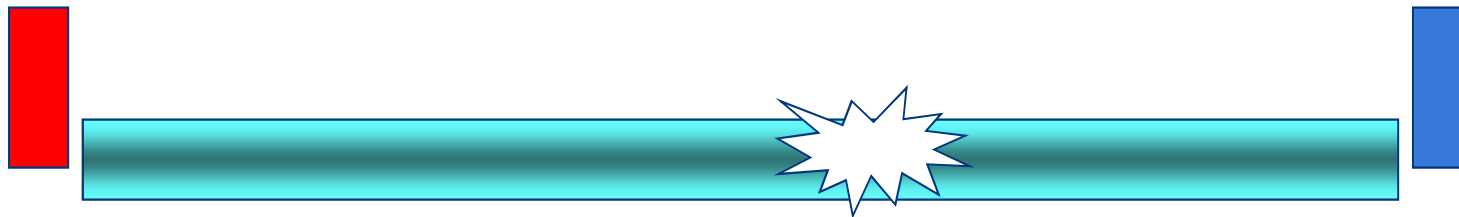
Halma Water Management

<i>Factors producing good quality leak noise</i>	<i>Factors producing poor quality leak noise</i>
High water pressure	Low water pressure
Hard backfill	Soft backfill
Small rupture	Split mains
Clean pipes	Encrusted pipes
Metallic pipes	Soft/Lined pipes
Small diameter pipes	Large diameter pipes

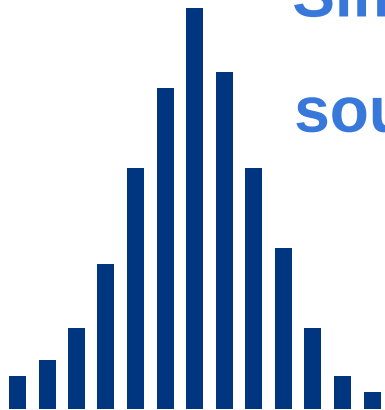
Correlator Terminology & Principles

Correlation

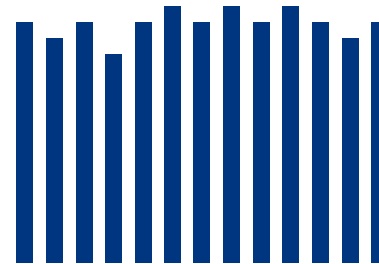
To obtain a good correlation display, noise **MUST** be heard at each sensor.



Similar
sounds



Dissimilar
sounds



We must give the correlator basic information for the correlator to give us a result :-

- **Distance**
- **Pipe Diameter**
- **Pipe Material**
- **Velocity (generally automatically calculated)**

Correlation Formula

$$\frac{L = D - (V \times Td)}{2}$$

L = Leak position (m) (metres)

D = Length of pipe (m) (metres)

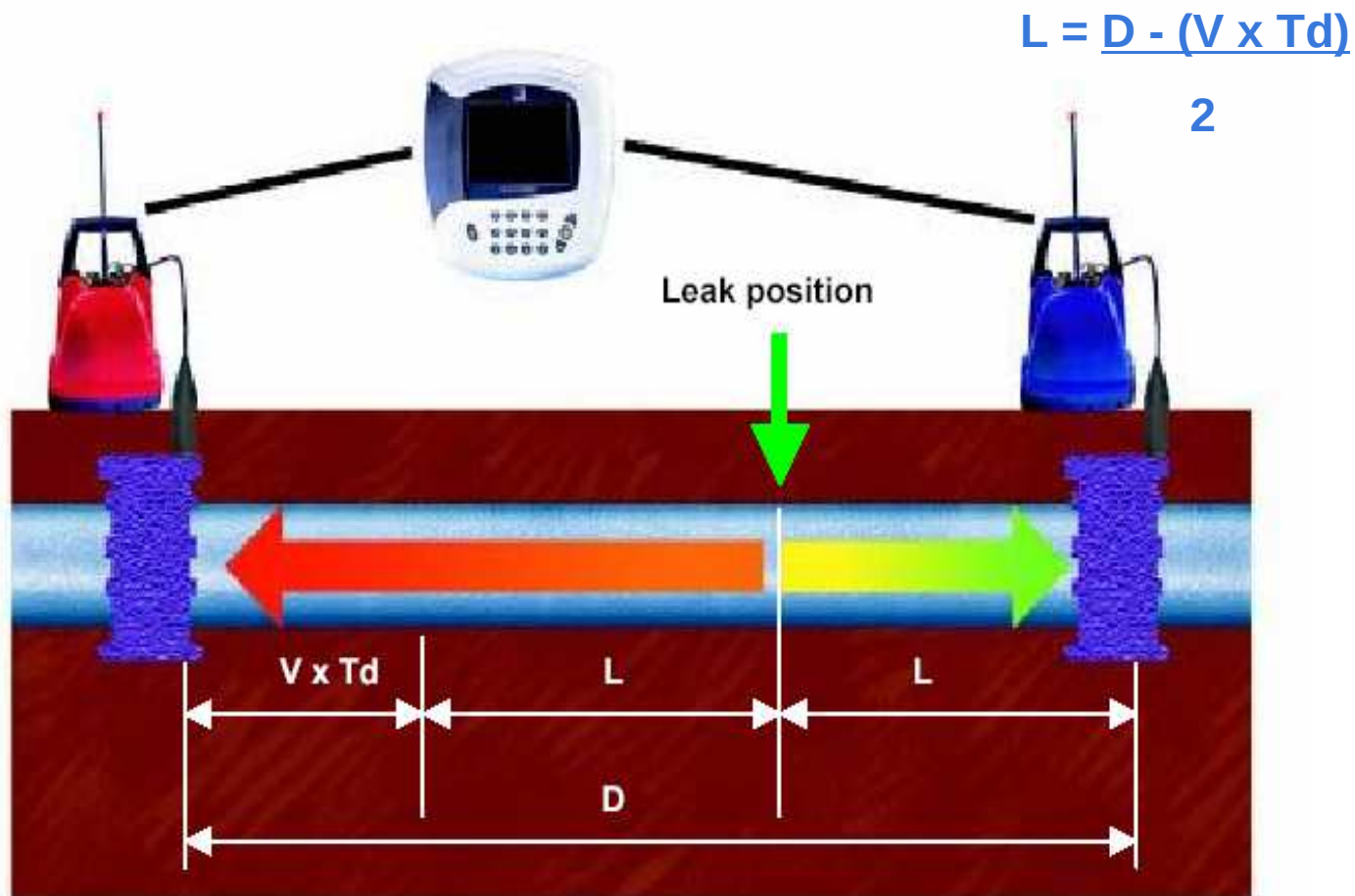
V = Velocity of sound along pipe (m/ms) (metres per millisecond)

Td = time delay (ms) (milliseconds)

Correlation Calculations



Halma Water Management



If a leak was exactly midway between the two correlation points, the noise pattern would be identical.

If a leak correlated is closer to one sensor then there is a **“Time Delay”** (of only a fraction of a second) for noise to reach the furthest sensor.

The smaller the “Time Delay” the more accurate the result

**Velocity is the speed at which sound travels
through a pipe**

- **Material - Metallic faster, Plastics slower**
- **Size - The larger the pipe the slower the velocity**
- **Age (Internal Condition)**
- **Repairs (Mixed Materials)**

Correlation Formula

D = 100m, v = 1m/ms, Td = 80ms towards blue

Substitute in correlation formula

$$L = \frac{100 - (1 \times 80)}{2}$$

2

$$= \frac{100 - 80}{2}$$

2

$$= \frac{20}{2}$$

2

$$= 10\text{m (Blue)}$$

Order of calculation

- 1. Multiply***
- 2. Subtract***
- 3. Divide***

Calculating With Wrong Distance

IF Velocity = 1.28, Time Delay = 28.2 & Distances change from 150, 145, 120m

$$L = \frac{150 - (1.28 \times 28.2)}{2} = \frac{150 - 36.09}{2} = \frac{113.91}{2} \quad \text{Length} = 56.95\text{m}$$

$$L = \frac{145 - (1.28 \times 28.2)}{2} = \frac{145 - 36.09}{2} = \frac{108.91}{2} \quad \text{Length} = 54.45\text{m}$$

$$L = \frac{120 - (1.28 \times 28.2)}{2} = \frac{120 - 36.09}{2} = \frac{83.91}{2} \quad \text{Length} = 41.95\text{m}$$

Calculating With Wrong Velocity

IF Time Delay = 28.2, Distances 150m & Velocity change from 1.28, 1, 0.4

$$\frac{L=150 - (1.28 \times 28.2)}{2} \quad \frac{L=150 - 36.09}{2} \quad \frac{L=113.91}{2} \quad \text{Length}= 56.95 \text{ m}$$

$$\frac{L=150 - (1 \times 28.2)}{2} \quad \frac{L=150 - 28.2}{2} \quad \frac{L=121.8}{2} \quad \text{Length}= 60.90 \text{ m}$$

$$\frac{L=150 - (0.4 \times 28.2)}{2} \quad \frac{L=150 - 11.28}{2} \quad \frac{L=138.72}{2} \quad \text{Length}= 69.36 \text{ m}$$

Calculating With Small Time Delays

Advantages of having the leak in the central position between sensors when unsure of the velocity of the pipe.

IF Time Delay = 1.4, Distances 150m & Velocity change from 1.28, 1, 0.4

$\frac{L=150 - (1.28 \times 1.4)}{2}$	$\frac{L=150 - 1.792}{2}$	$\frac{L=148.21}{2}$	Length= 74.10 m
$\frac{L=150 - (1 \times 1.4)}{2}$	$\frac{L=150 - 1.4}{2}$	$\frac{L=148.60}{2}$	Length= 74.30 m
$\frac{L=150 - (0.4 \times 1.4)}{2}$	$\frac{L=150 - 0.56}{2}$	$\frac{L=149.44}{2}$	Length= 74.72 m

Calculating With Large Time Delays

The leak position in these examples is closer to one sensor than the other, therefore a larger Td

IF Time Delay = 31.3, Distances 150m & Velocity change from 1.28, 1, 0.4

$\frac{L=150 - (1.28 \times 31.3)}{2}$	$\frac{L=150 - 40.06}{2}$	$\frac{L=109.94}{2}$	Length= 54.97 m
$\frac{L=150 - (1 \times 31.3)}{2}$	$\frac{L=150 - 31.3}{2}$	$\frac{L=118.70}{2}$	Length= 59.35 m
$\frac{L=150 - (0.4 \times 31.3)}{2}$	$\frac{L=150 - 12.52}{2}$	$\frac{L=137.48}{2}$	Length= 68.74 m

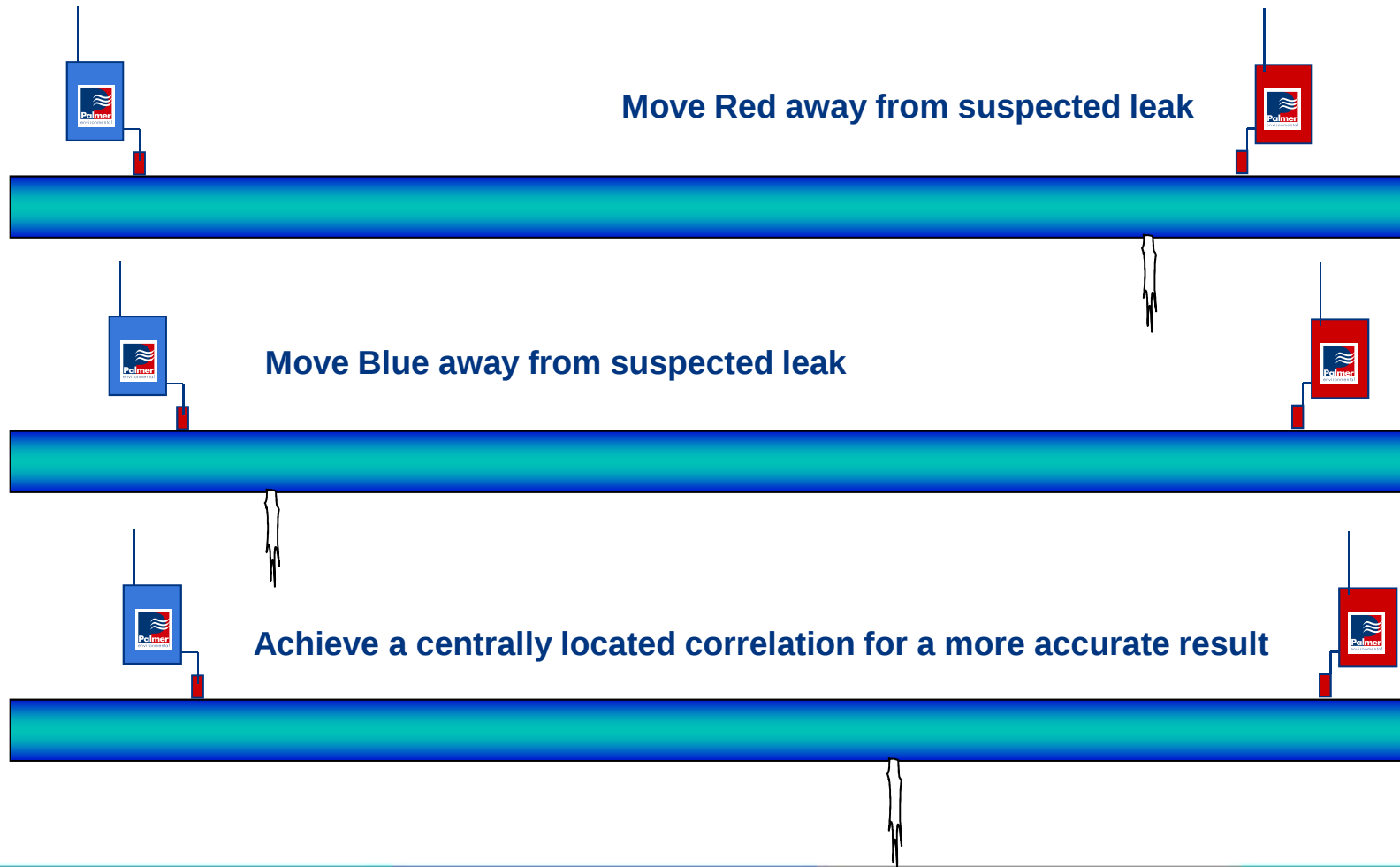
Rubbish In
=
Rubbish Out

Basic on Site Setup

Sensor Positioning



Halma Water Management

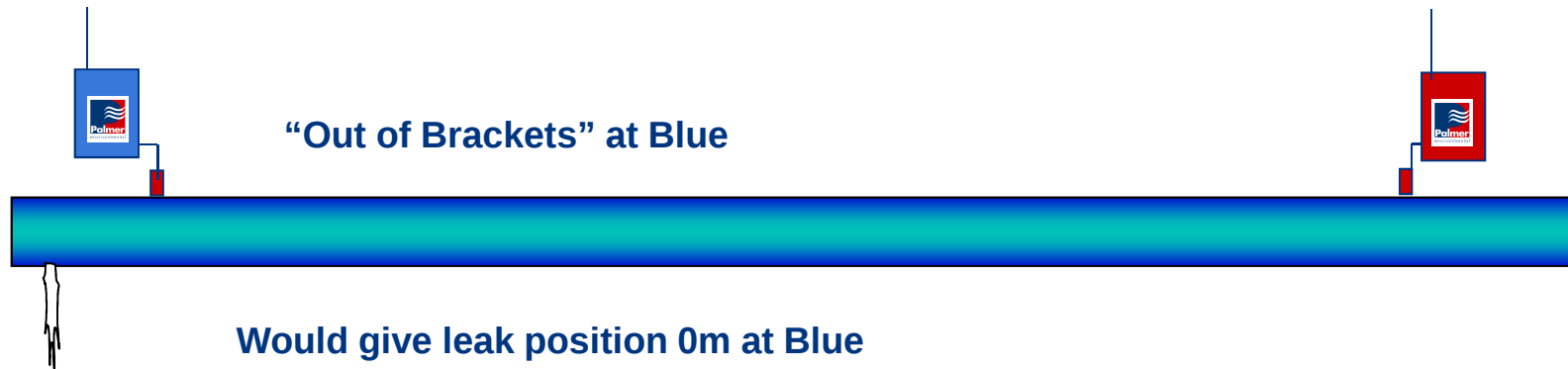
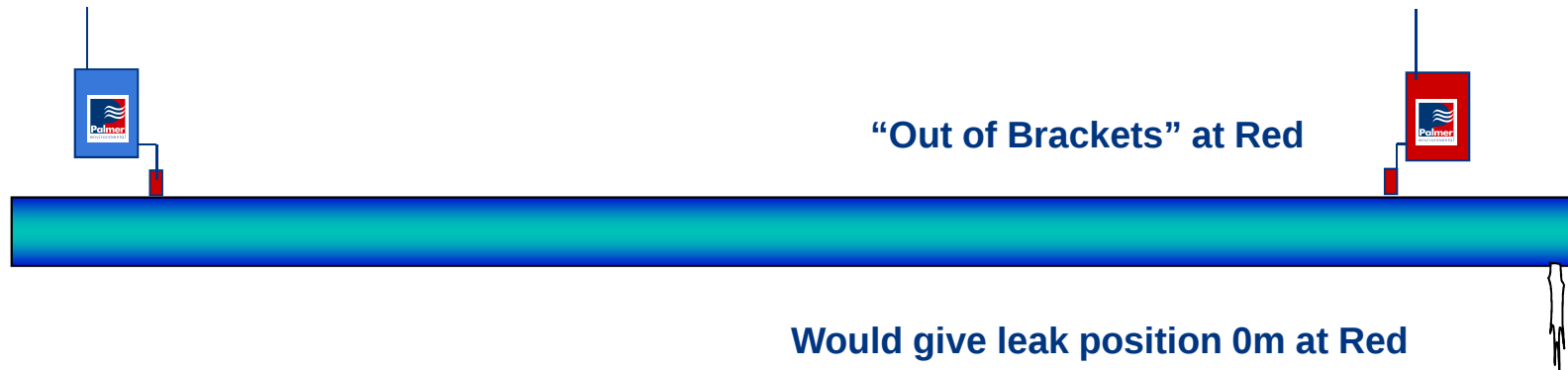


A HALMA COMPANY

Sensor Positioning



Halma Water Management

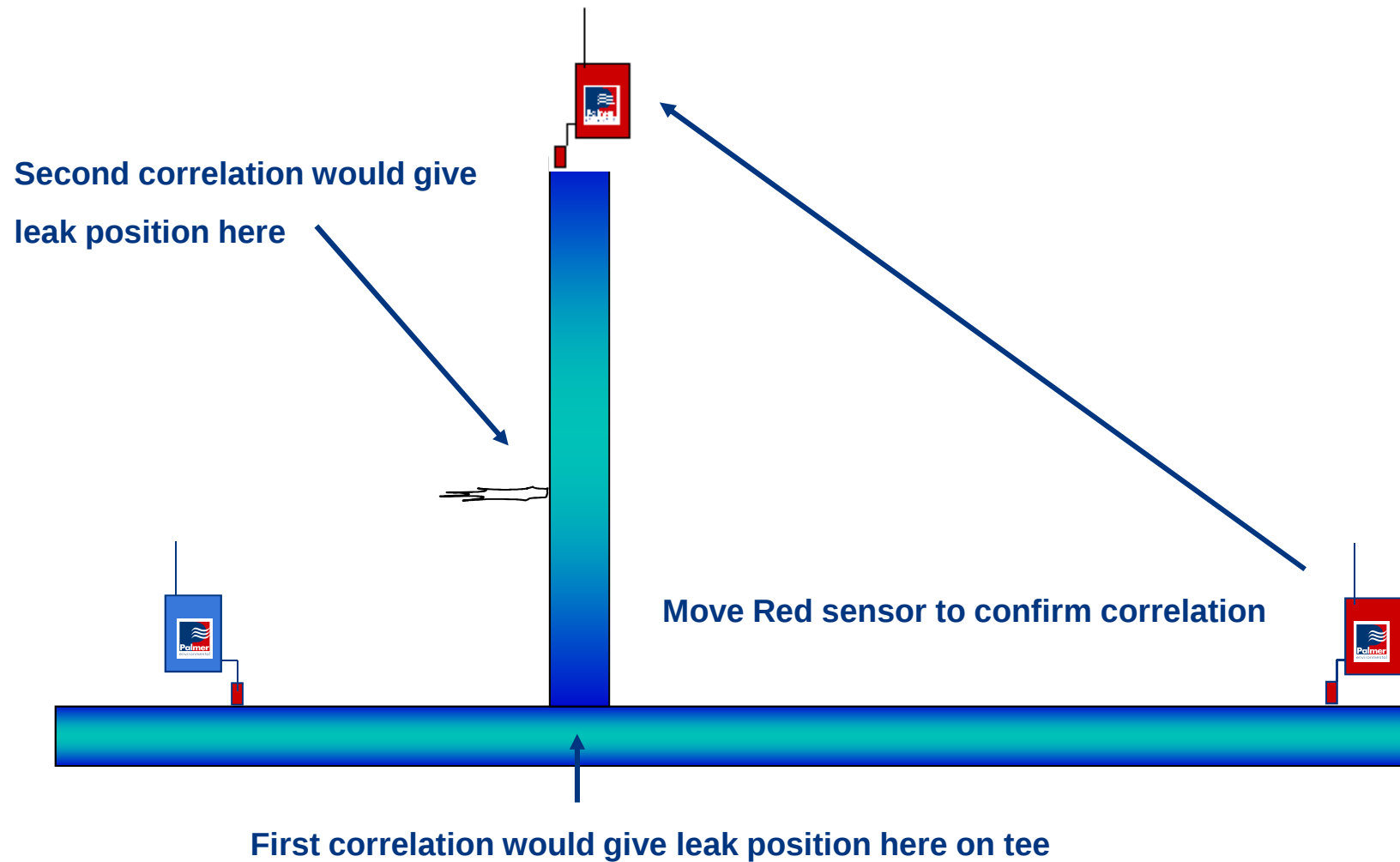


A HALMA COMPANY

Sensor Positioning



Halma Water Management

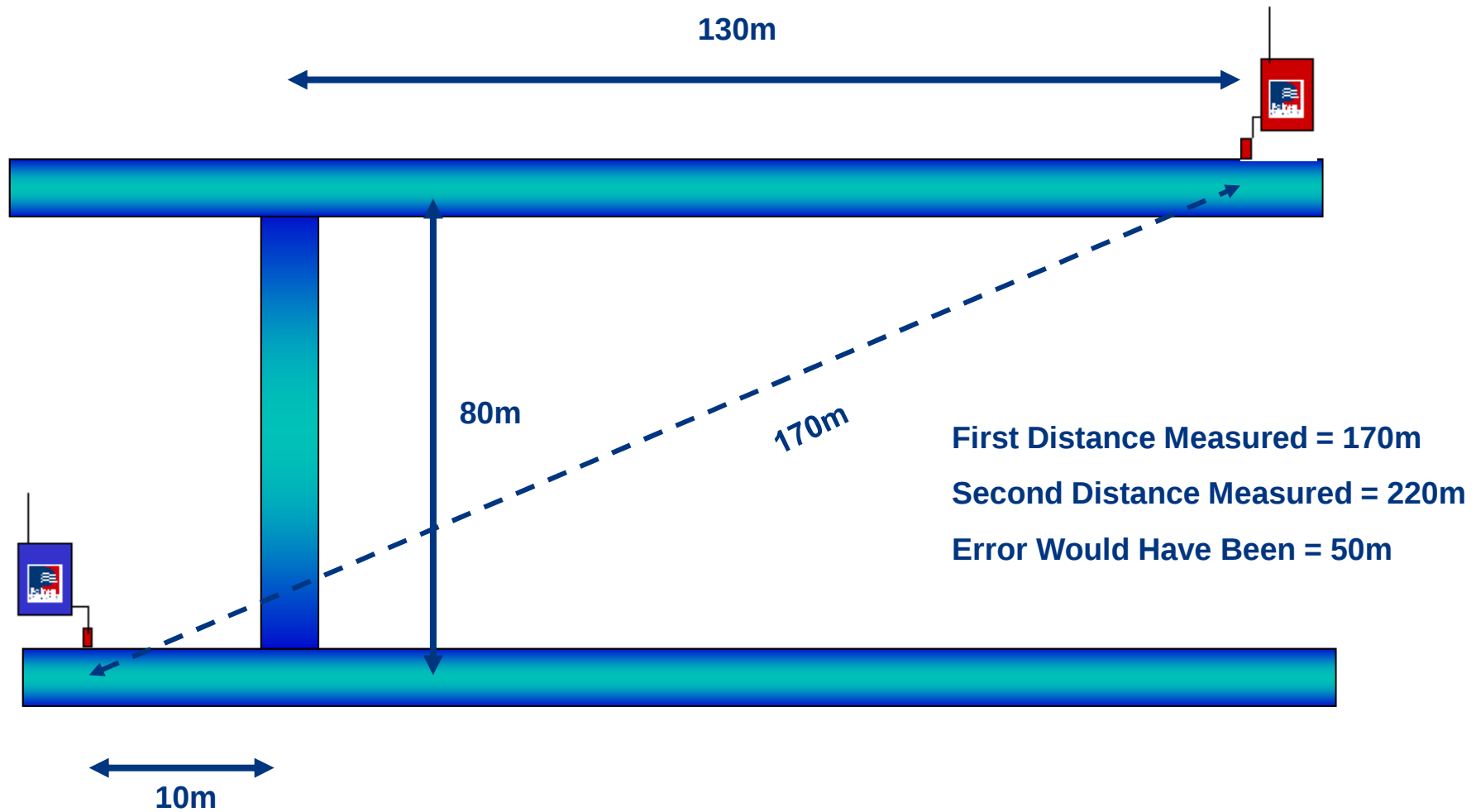


A HALMA COMPANY

Distance Measuring



Halma Water Management

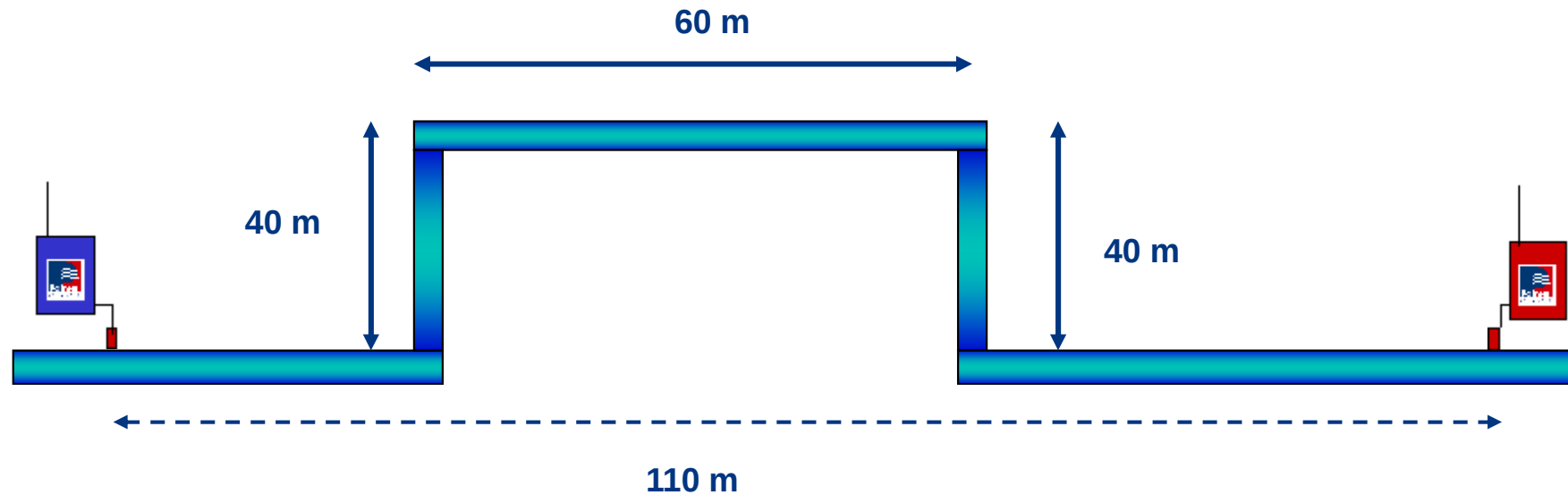


A HALMA COMPANY

Distance Measuring



Halma Water Management



First Measurement = 110 m

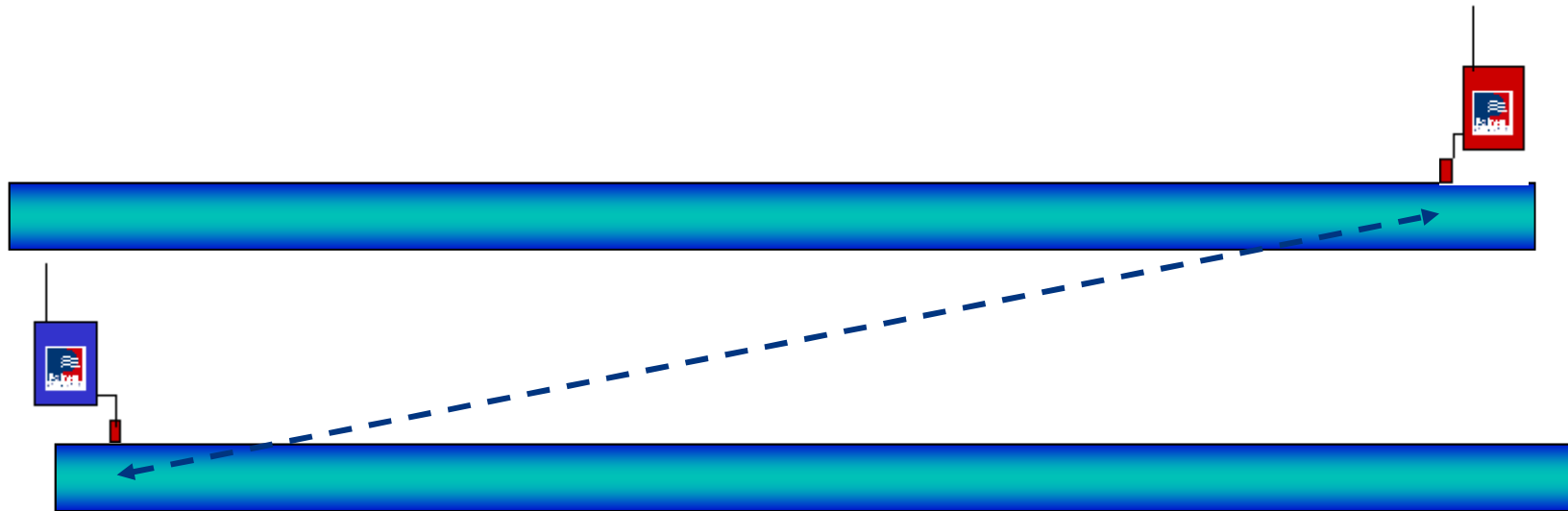
Second Measurement = 190 m

Error Would Have Been = 80 m

Distance Measuring



Halma Water Management



A HALMA COMPANY

Outstations

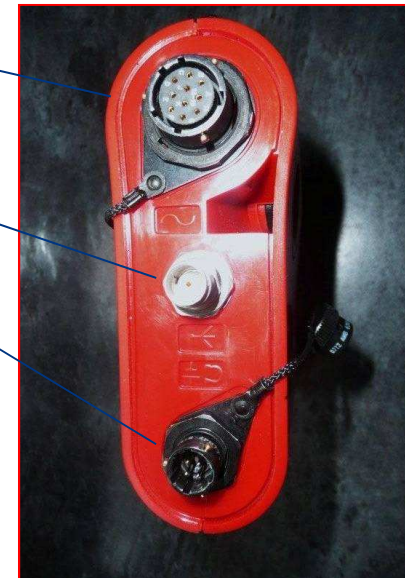
Outstations

1 - On / Off

2 - Sensor

3 - Aerial

4 - Charge / Headphones



**The outstations are turned on via the small button
on the Front**

Press once and the green LED button will flash

**To turn outstation off, hold down button for two
seconds, the green LED will stop flashing**

You can listen direct at the outstations via the headphones. This can only be done when no correlation is taking place

To check the sensor is working ok perform a “tickle test”

Plug both sensor and and headphones into the outstation

Gently rub your finger over the sensors magnet, you should be able to here crisp, clean sound. If no sound is heard you may have a fault and will not correlate correctly

Interface Unit

Interface Unit



**1 - Headphones
& charging**

2 - Sensor

3 - Aerial

Charging

The interface unit is charged from flat in 6 hours

The outstations are charged from flat in 5 hours

The batteries can't be overcharged

Charging

After connecting charger cables

**The interface unit will turn ON automatically.
The interfaces large green LED will light
constantly while charging, then flash rapidly
when almost fully charged.**

**The outstations will turn ON automatically. The
outstations green LED will light constantly
while charging, then flash rapidly when almost
fully charged.**

All units automatically turn off when unplugged

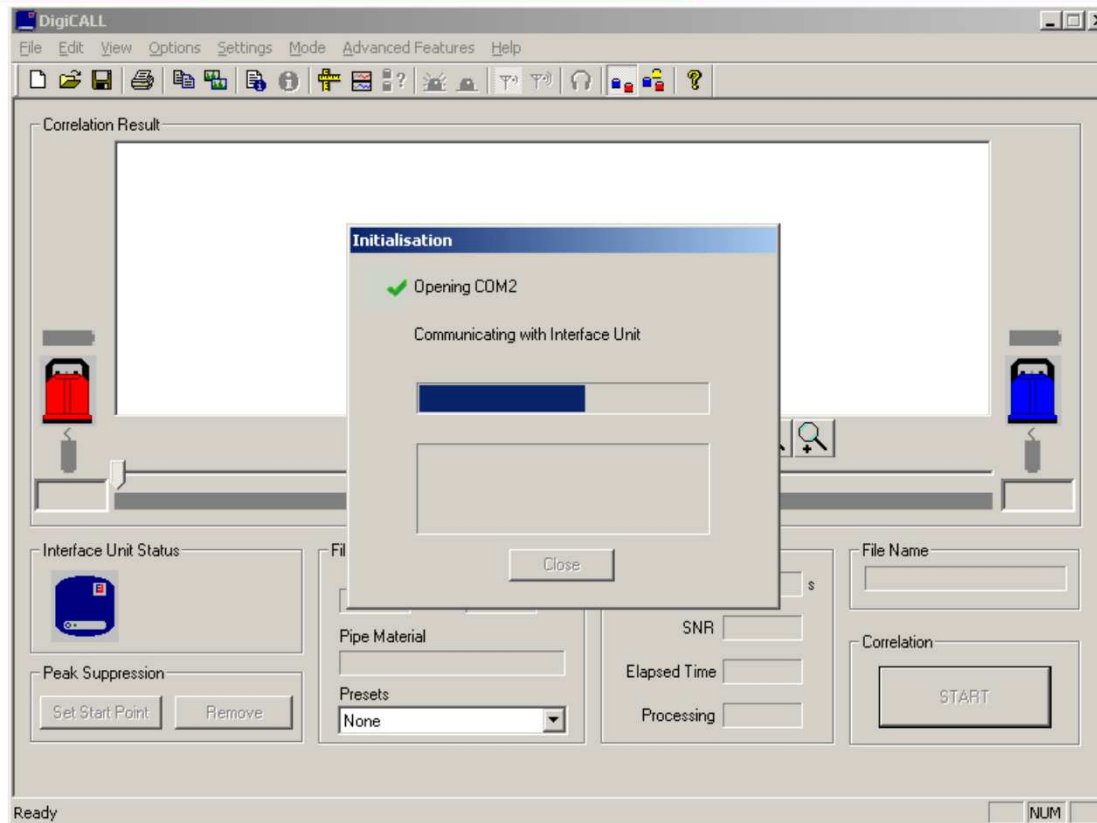


Halma Water Management

Setting Up

A HALMA COMPANY

Setting Up

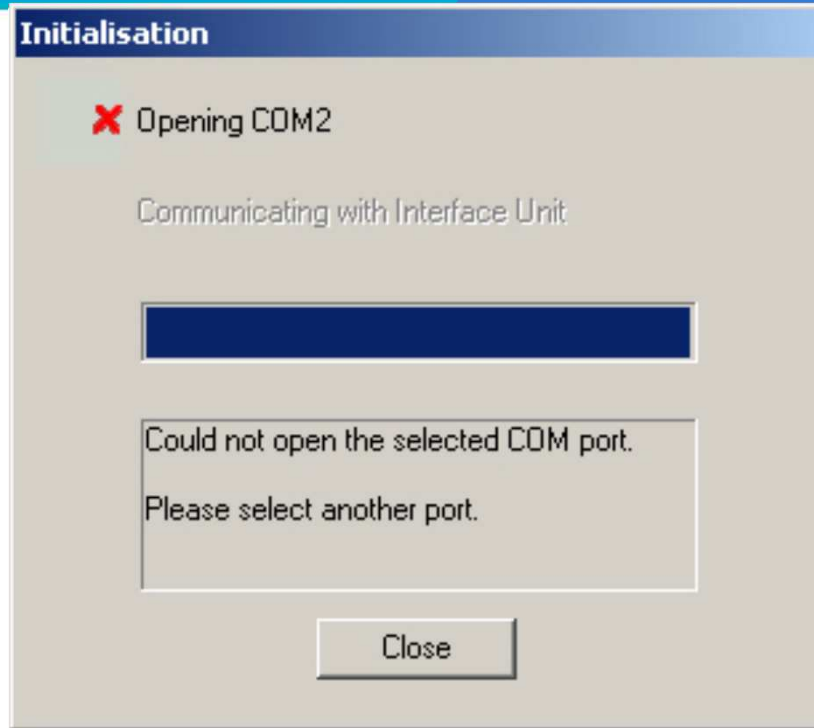


Start the DigiCall software on PC

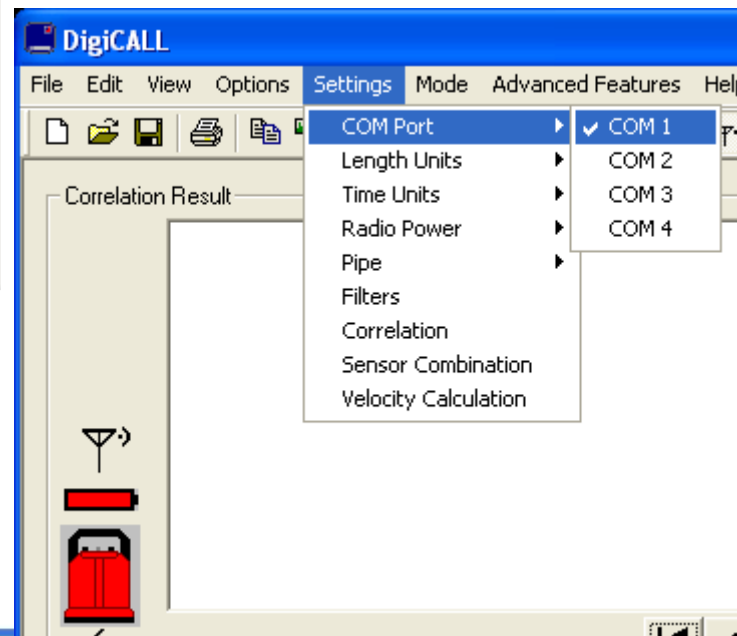
Setting Up



Halma Water Management



**Depending on PC you
may have to change
com port**



A HALMA COMPANY



Halma Water Management

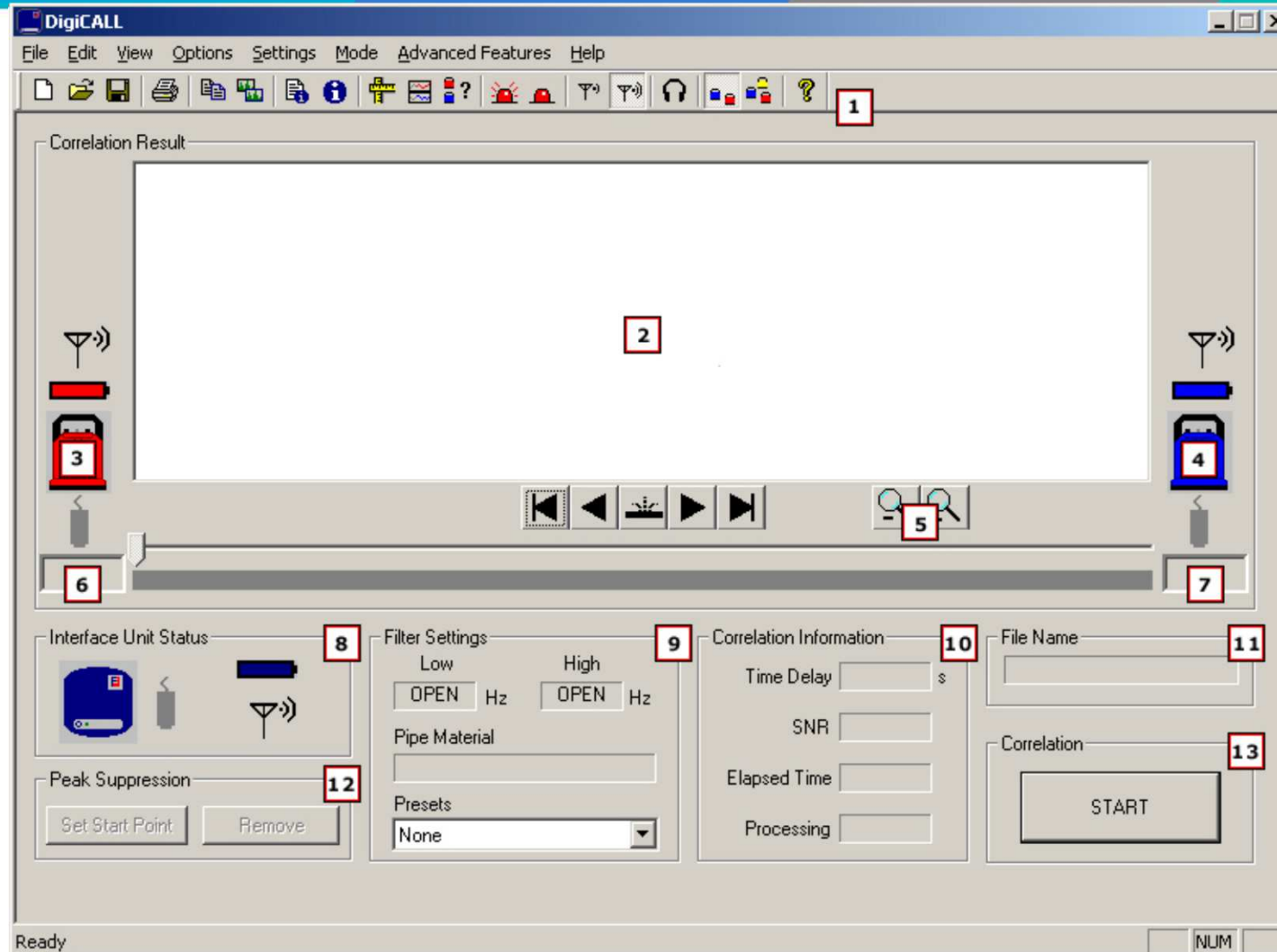
Main Screen

A HALMA COMPANY

Main Screen



Halma Water Management



A HALMA COMPANY

Main Screen

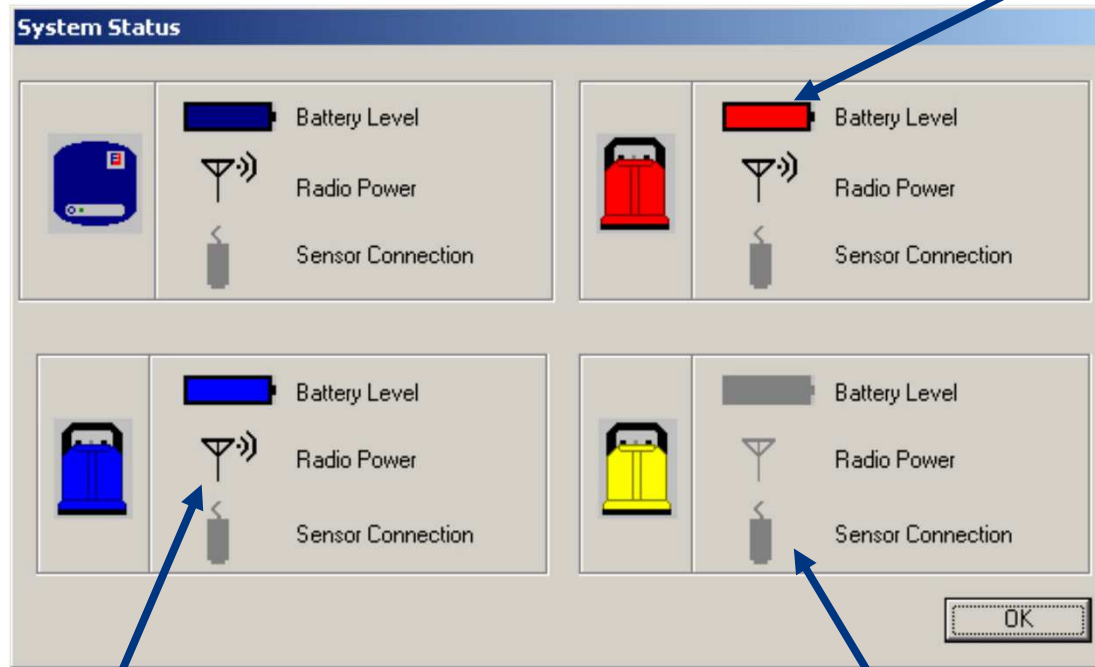


Halma Water Management

- 1 - Tool bar**
- 2 - Correlation display**
- 3 - Red outstation status**
- 4 - Blue outstation status**
- 5 - Zoom in / out**
- 6 - Leak distance from red sensor**
- 7 - Leak distance from blue sensor**
- 8 - Interface unit status**
- 9 - Filter settings**
- 10 - Correlation information**
- 11 - Correlation file name**
- 12 - Peak suppression option**
- 13 - Start / stop correlation**

Main Screen

Indicates full battery



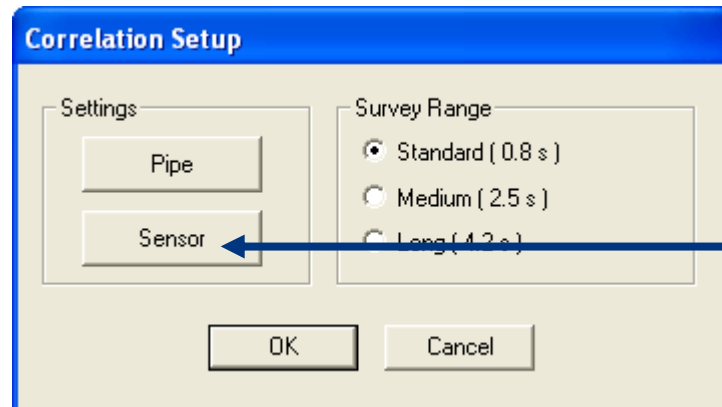
Indicates high radio power

..) is low .)) is high

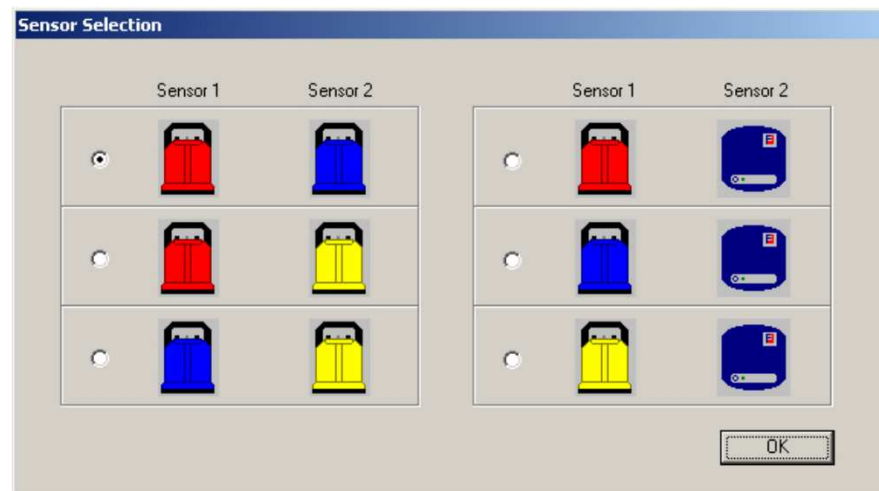
Indicates nothing working
or not communicating

Performing a Correlation

Performing a Correlation



Click on “Start” from
main screen,
then click “Sensor”

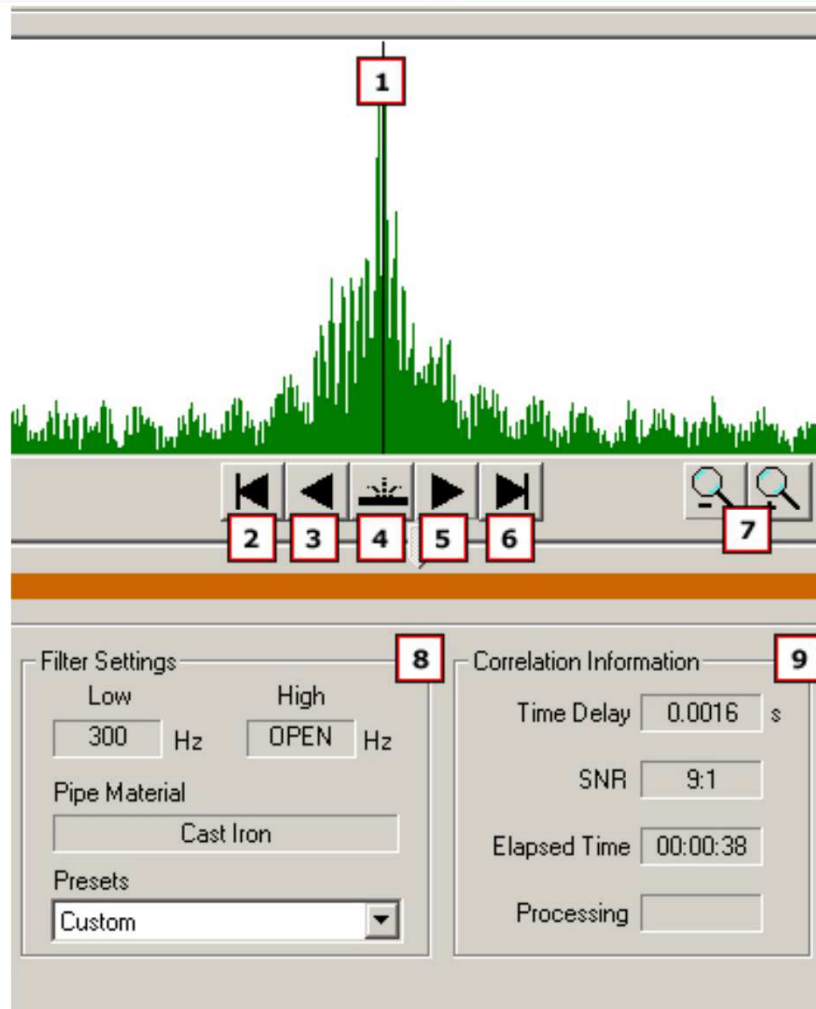


Select sensor
combination, then
click “Ok”, then
click “Ok” again
from the screen
above

Performing a Correlation

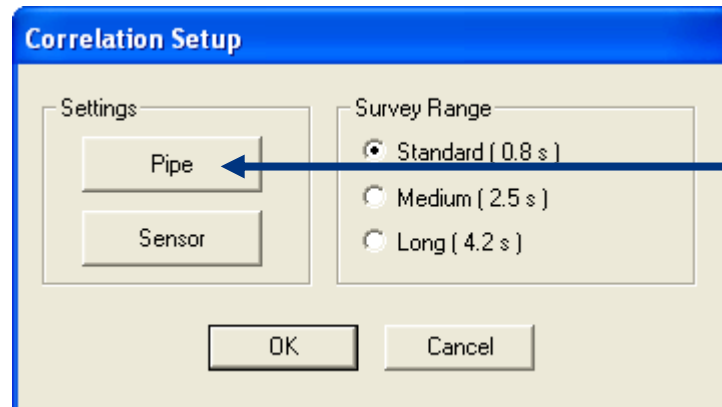


Halma Water Management

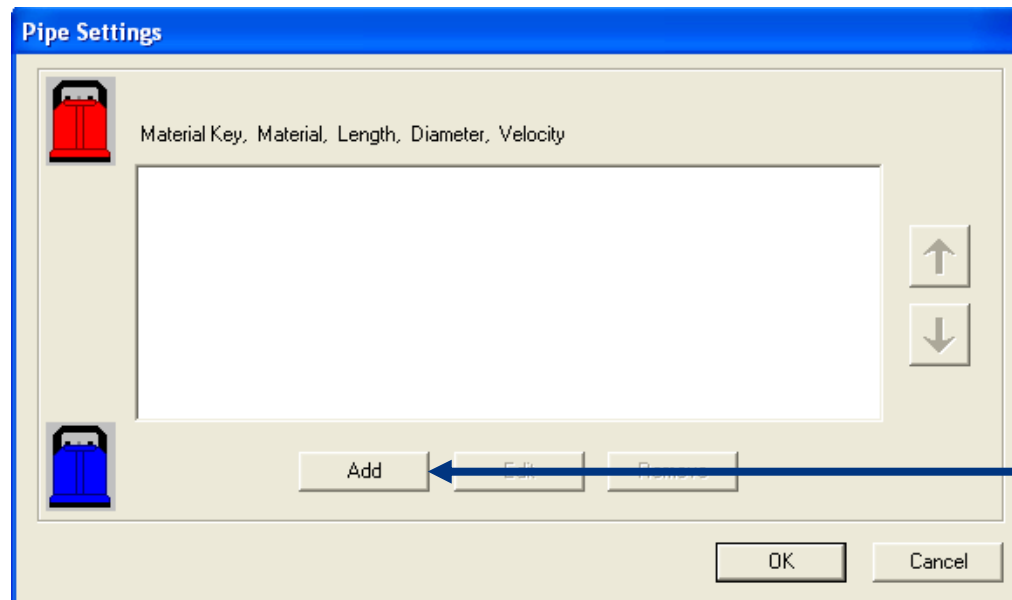


- 1 - Cursor (highest peak)
- 2 - Moves cursor to far left
- 3 - Moves cursor left
- 4 - Centres cursor on leak position
- 5 - Moves cursor right
- 6 - Moves cursor to far right
- 7 - Zoom in / out
- 8 - Filter settings
- 9 - Correlation information
 - SNR (Signal Noise Ratio)

Pipe Data

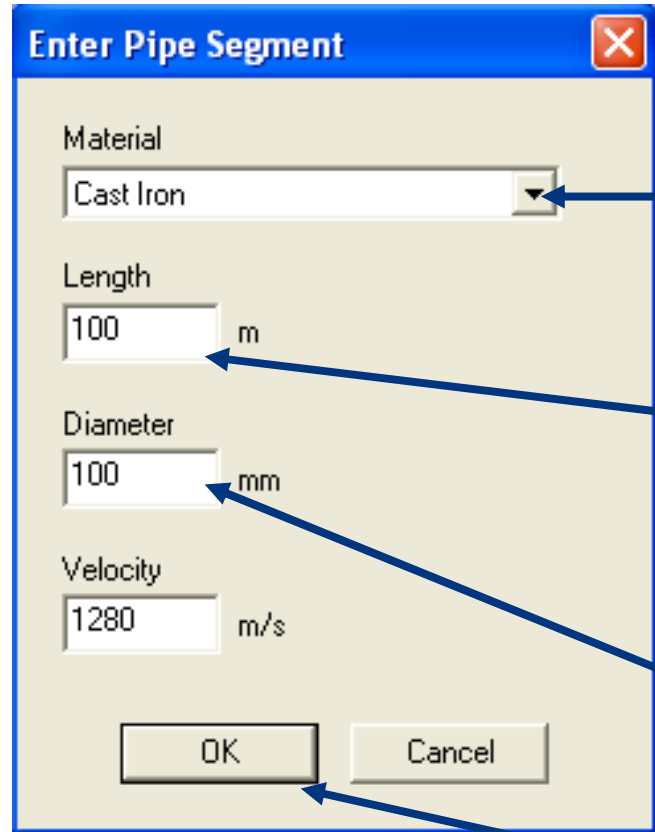


Click on “Start” from
main screen,
then click “Pipe”



Click on “Add”

Pipe Data



The screenshot shows a dialog box titled "Enter Pipe Segment" with a close button (X) in the top right corner. The dialog contains four input fields: "Material" with a dropdown menu showing "Cast Iron", "Length" with a text box containing "100" and a unit "m", "Diameter" with a text box containing "100" and a unit "mm", and "Velocity" with a text box containing "1280" and a unit "m/s". At the bottom are "OK" and "Cancel" buttons. Four blue arrows point from the text instructions on the right to the "Material" dropdown, the "Length" text box, the "Diameter" text box, and the "OK" button.

Click on “Material” and highlight correct material

Click in “Length” and enter correct length

Click in “Diameter” and enter correct diameter

Then click “Ok”

Pipe Data

Pipe Settings

Material Key, Material, Length, Diameter, Velocity

Cast Iron	100.00	m	100	mm	1280	m/s
-----------	--------	---	-----	----	------	-----

↑
↓

Add Edit Remove

OK Cancel

The selected data is displayed, to correlate click “Ok”, then click “Ok” again

Pipe Settings

Material Key, Material, Length, Diameter, Velocity

Cast Iron	100.00	m	100	mm	1280	m/s
Asbestos Cement	123.00	m	150	mm	1000	m/s
Copper	8.00	m	12	mm	1260	m/s

↑
↓

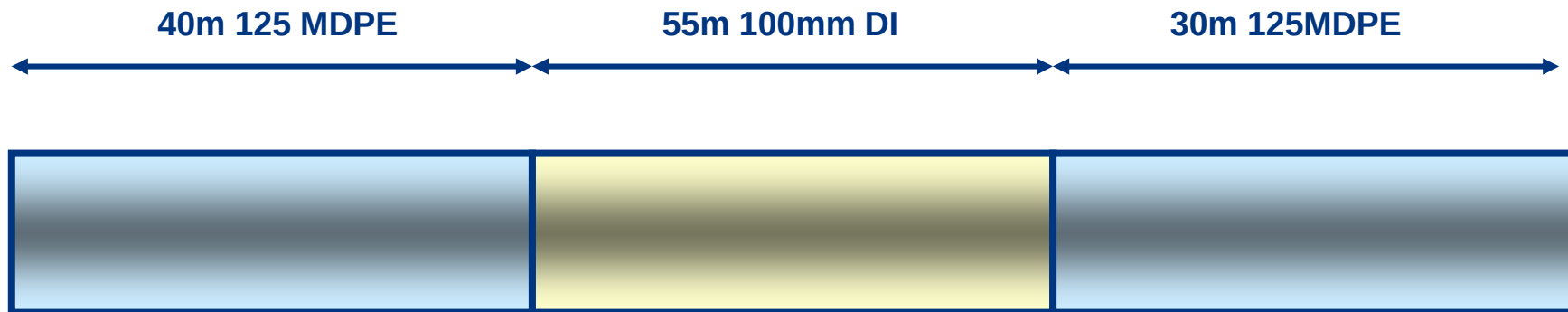
Add Edit Remove

OK Cancel

To add more pipe data, click “Add” and enter the next material. Click “Ok” when finished to correlate, then click “Ok” again.

Up to 10 Multiple pipe entries

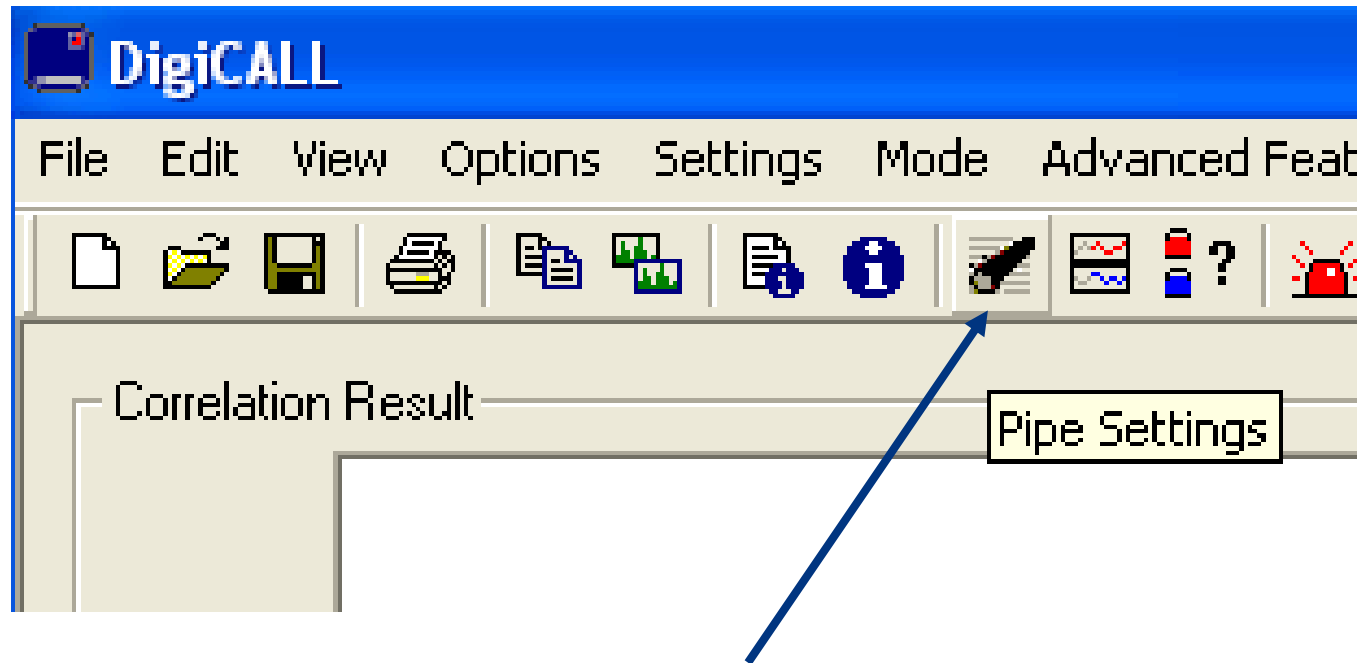
Mixed Material Function



This function is used where a stretch of main to be correlated contains 2 or more different materials or pipe diameters, thus changing the velocity of the pipe to be correlated.

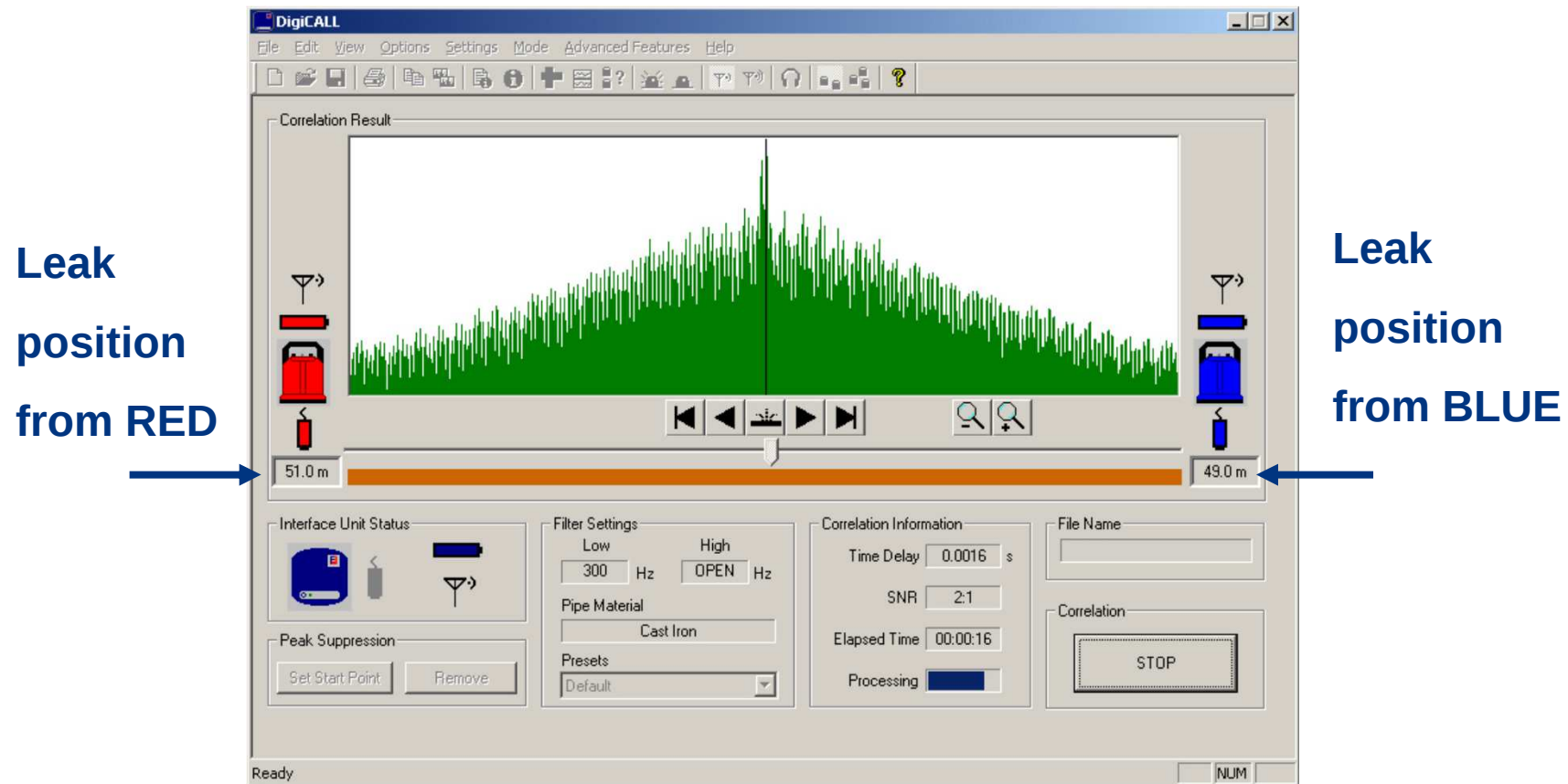
Up to 10 different materials / sizes can be entered in a single correlation.

Pipe Data



To change pipe details after the first correlation, click on the “Pipe Settings” icon and change as previously shown, before re-correlating

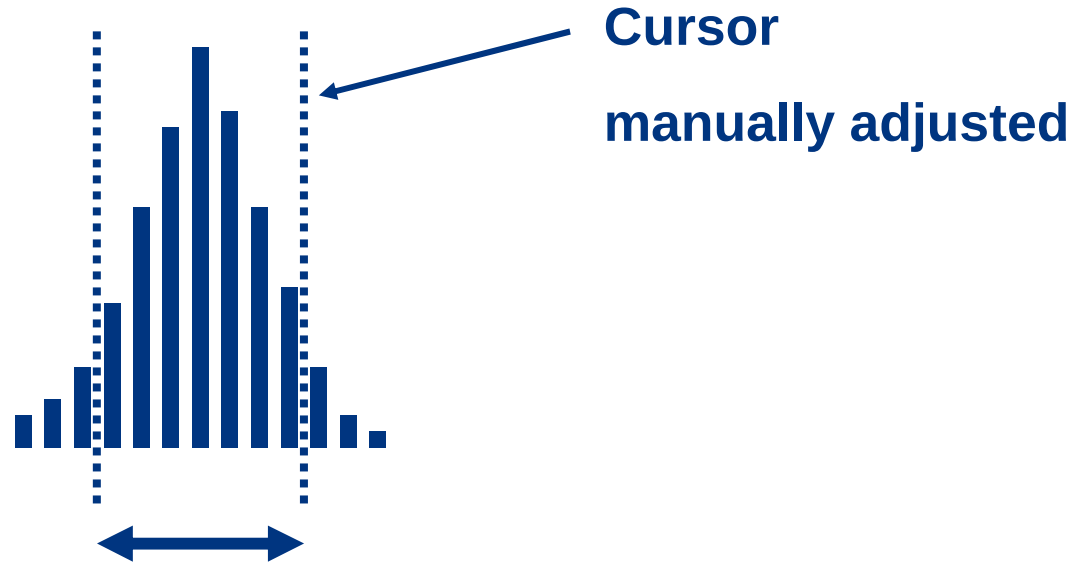
Correlation Result



Interpreting Results

Interpreting Results

Shape of
peak

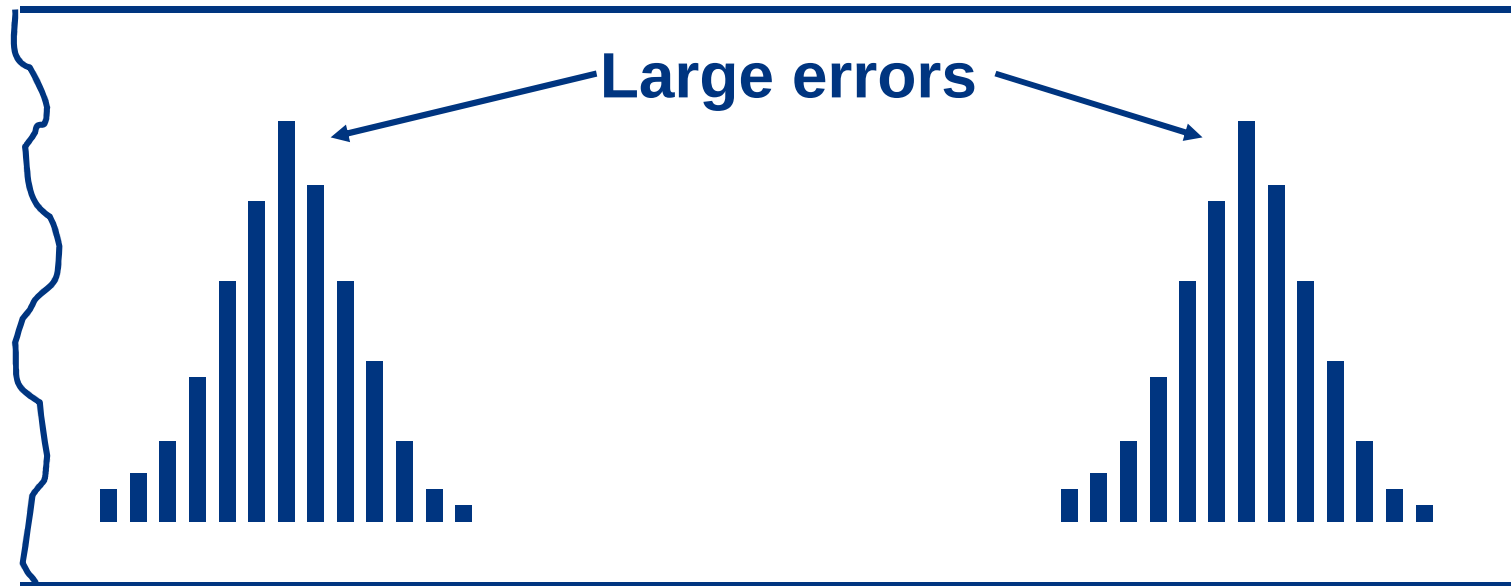


This represents the area in the ground to investigate further

Generally:- Broad peaks = poor accuracy

Sharp peaks = greater accuracy

Position of peak

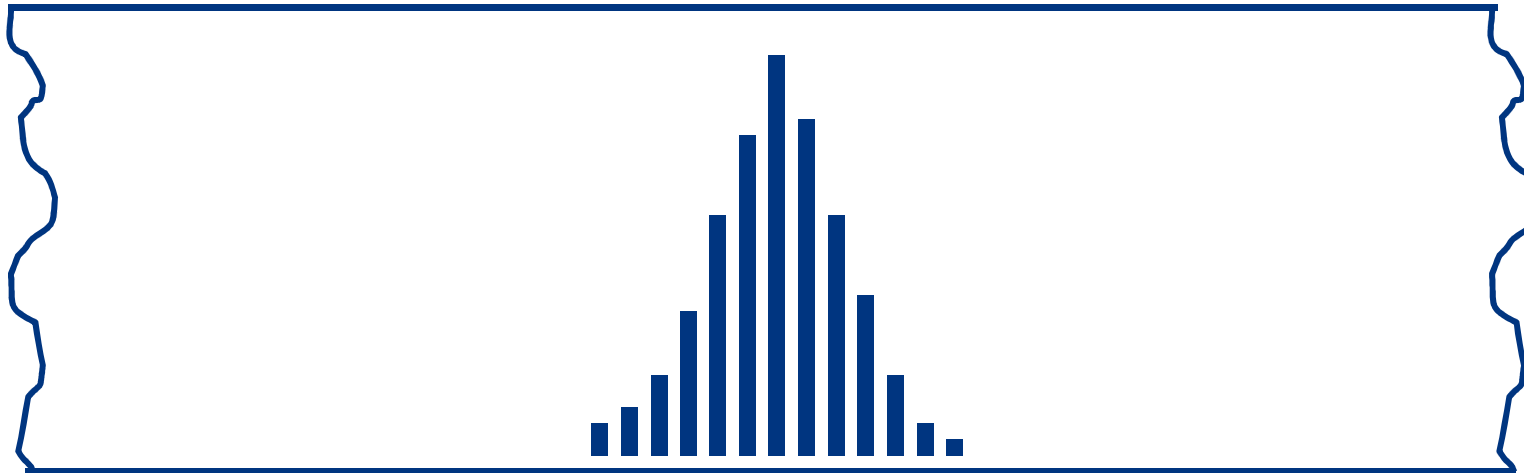


Velocity is very important!

Small velocity errors will lead to large leak position errors.

Never dig a hole based on a leak location close to a sensor, unless you have a very accurate measurement of velocity or other evidence indicates a leak at that point.

Position of peak



Ideal leak position is in the central area between the sensors but beware of centre correlation.

Velocity has little effect when a near central correlation.

Note:- Not Applicable on mixed materials.

In practice about +/- 20% from the centre.



Halma Water Management

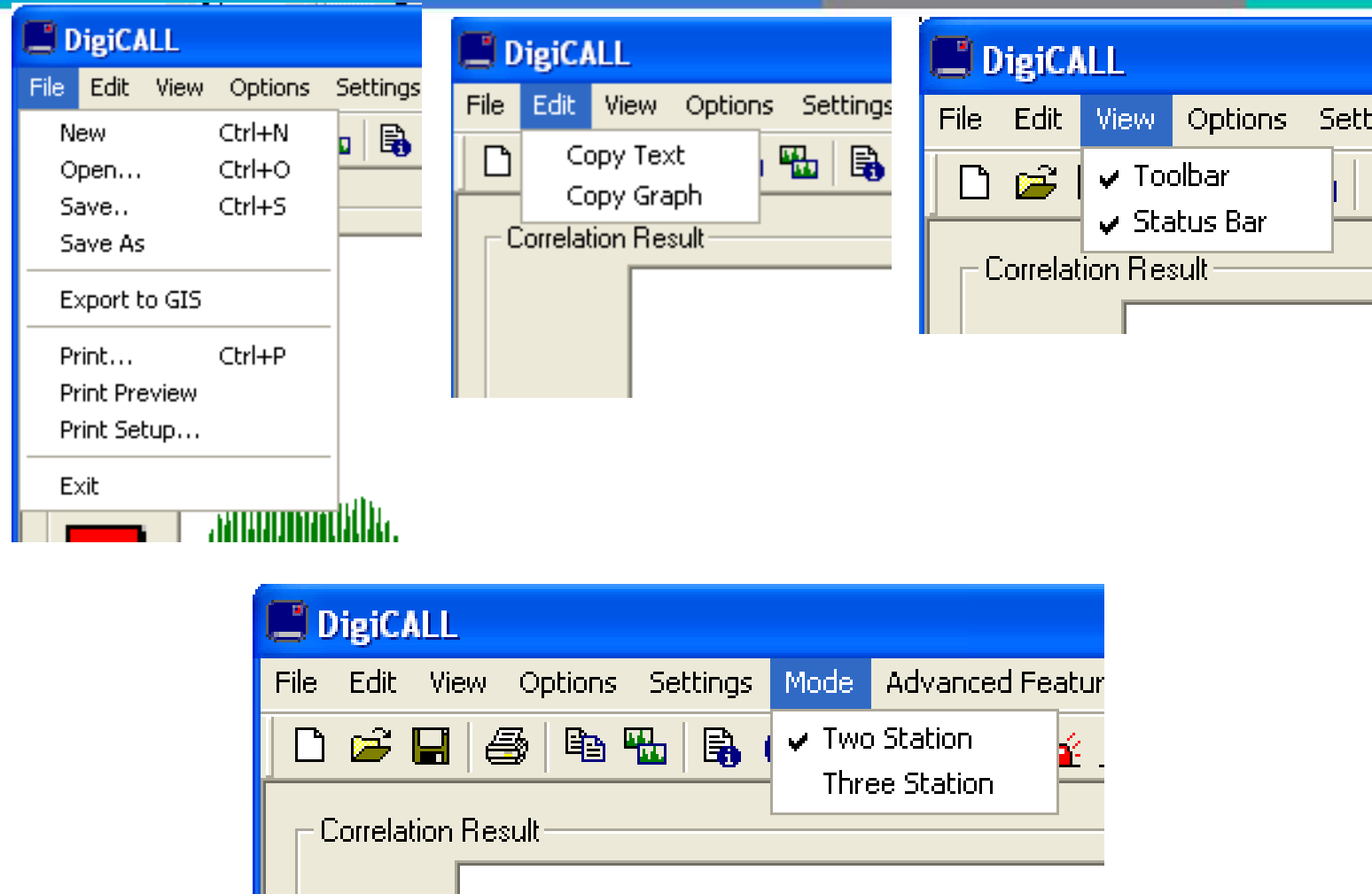
Extra Screen Information

A HALMA COMPANY

Main Screen



Halma Water Management



A HALMA COMPANY

Main Screen



Halma Water Management

The screenshot displays the DigiCALL software interface. The main window has a menu bar with File, Edit, View, Options, Settings, and Mode. The Options menu is open, showing File Information, System Status, System Information, Listening Mode, and Beacon Control. The File Information dialog is open, showing fields for Title (Test Site), Comment (Correlation at night), User Reference (12345678), Date Created (18 May 2005), and Time Created (10:44). The System Status dialog is also open, showing four status indicators for Battery Level, Radio Power, and Sensor Connection, each with a corresponding icon and a status bar. Arrows indicate the flow from the Options menu to the File Information dialog and the System Status dialog. A text box with the text "Remotely turn beacons on / off" is positioned to the right of the System Status dialog.

DigiCALL

File Edit View Options Settings Mode

File Information

Title: Test Site

Comment: Correlation at night

User Reference: 12345678 Date Created: 18 May 2005 Time Created: 10:44

OK Cancel

System Status

Battery Level Radio Power Sensor Connection

Battery Level Radio Power Sensor Connection

Battery Level Radio Power Sensor Connection

Battery Level Radio Power Sensor Connection

OK

Remotely turn beacons on / off

A HALMA COMPANY

Main Screen



Halma Water Management

The screenshot displays the DigiCALL software interface. The main window has a menu bar with File, Edit, View, Options, Settings, and Mode. The Options menu is open, showing File Information, System Status, System Information, Listening Mode, and Beacon Control. A blue arrow points from the System Information option to the System Information window. Another blue arrow points from the Listening Mode option to the Listening Mode window.

System Information

Icon	Firmware Version	Status
	Fw-042-02-201A	Compatible
	Fw-042-02-201A	Compatible
	Fw-042-02-201A	Compatible

OK

Listening Mode

Select Unit

☐	☐	☐	☐

Status

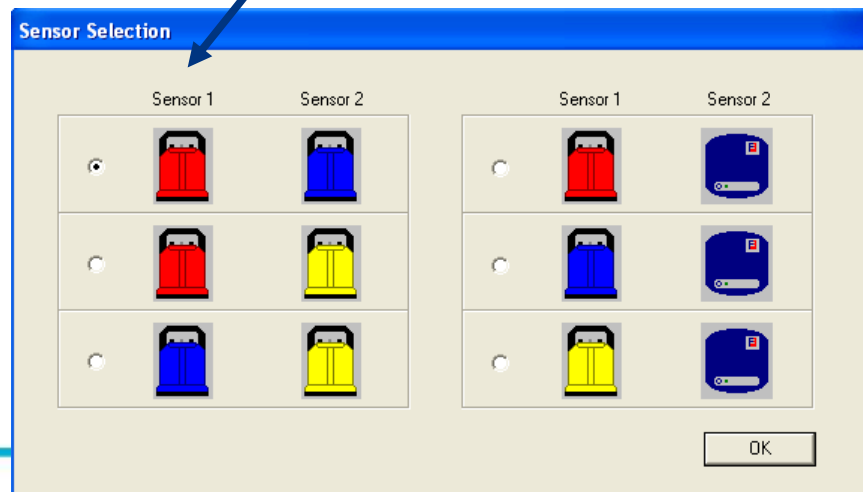
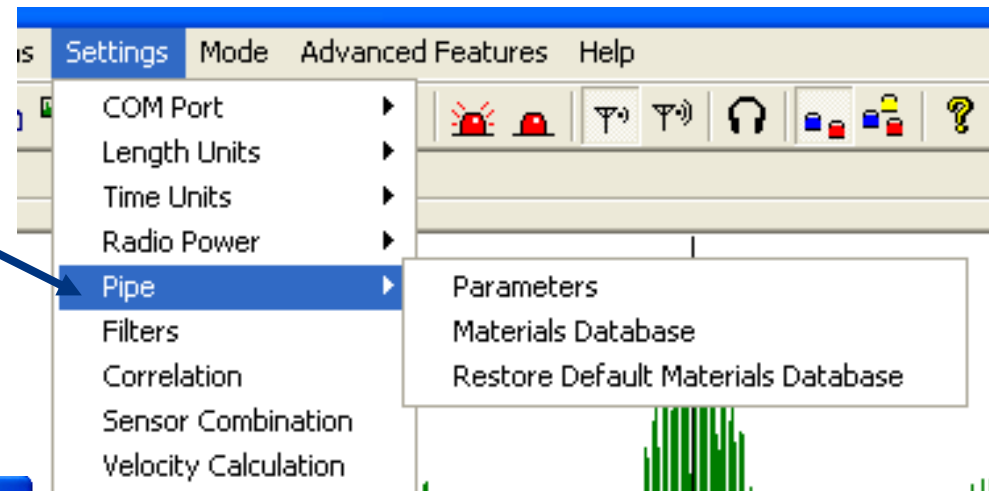
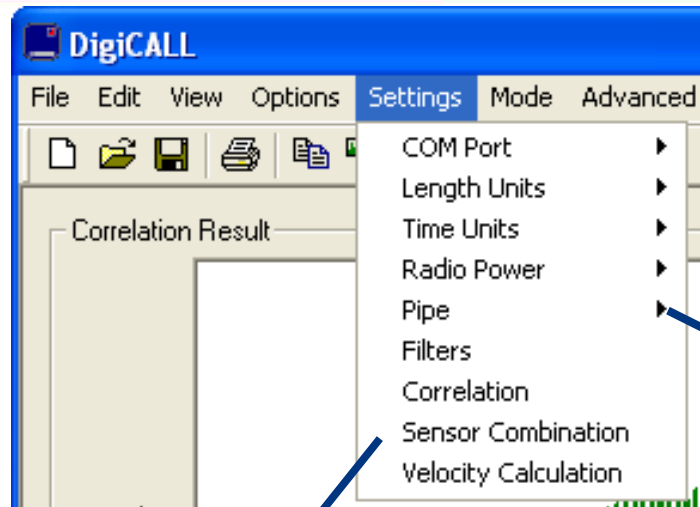
Close

A HALMA COMPANY

Main Screen



Halma Water Management

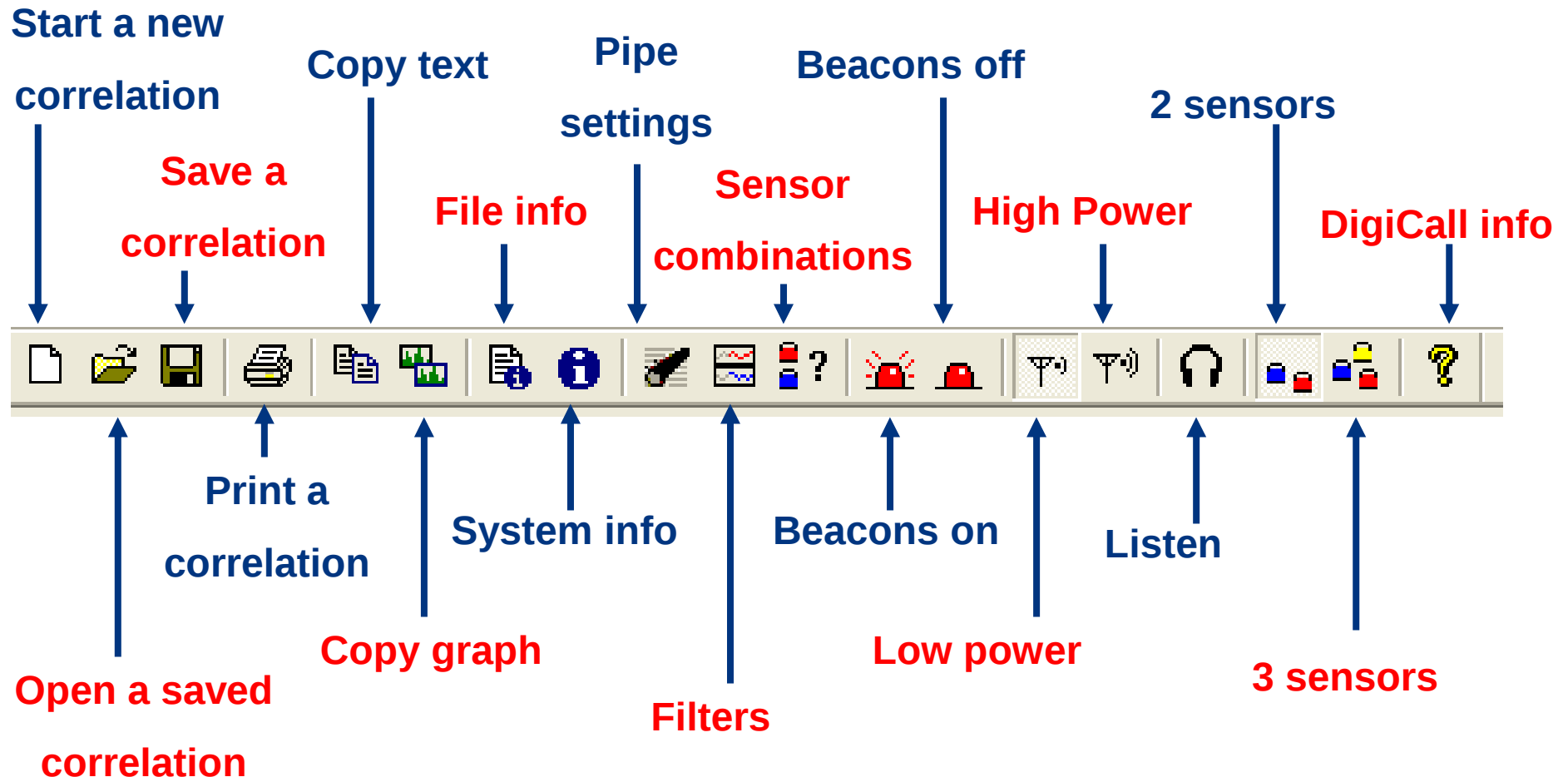


A HALMA COMPANY

Main Screen



Halma Water Management



Filters

Why Alter Filters ?

- 1. To improve shape of peak.**
- 2. To “unmask” hidden sources of noise.**

Lower frequencies occur on PLASTIC pipes

Higher frequencies occur on METALLIC pipes

To Change Filters

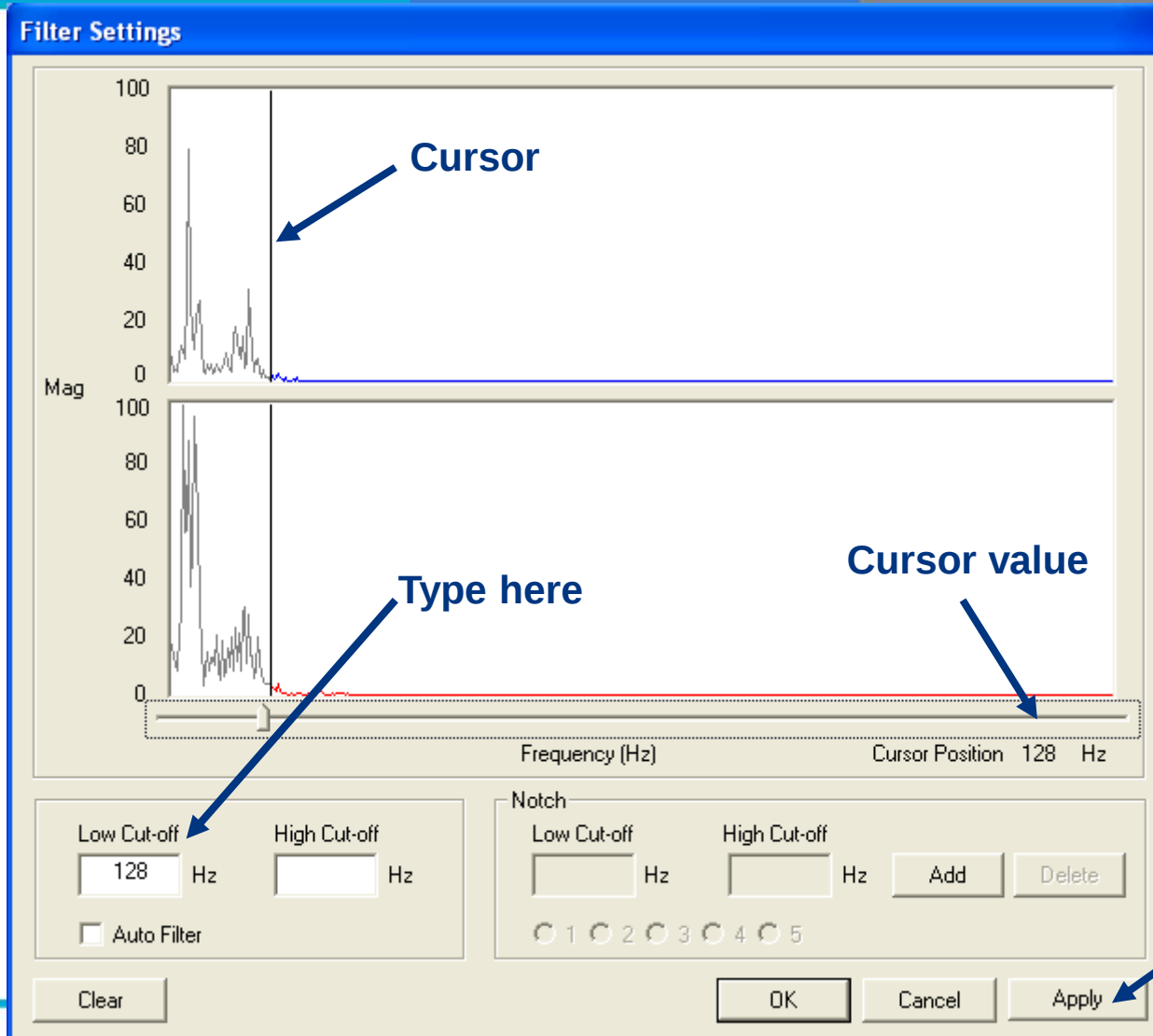


**To change from default filter settings, click here
from main tool bar**

Low Cut Off



Halma Water Management



A low cut off is shown
set at 128Hz

Move cursor to view
cut off position

Type in low cut off
value

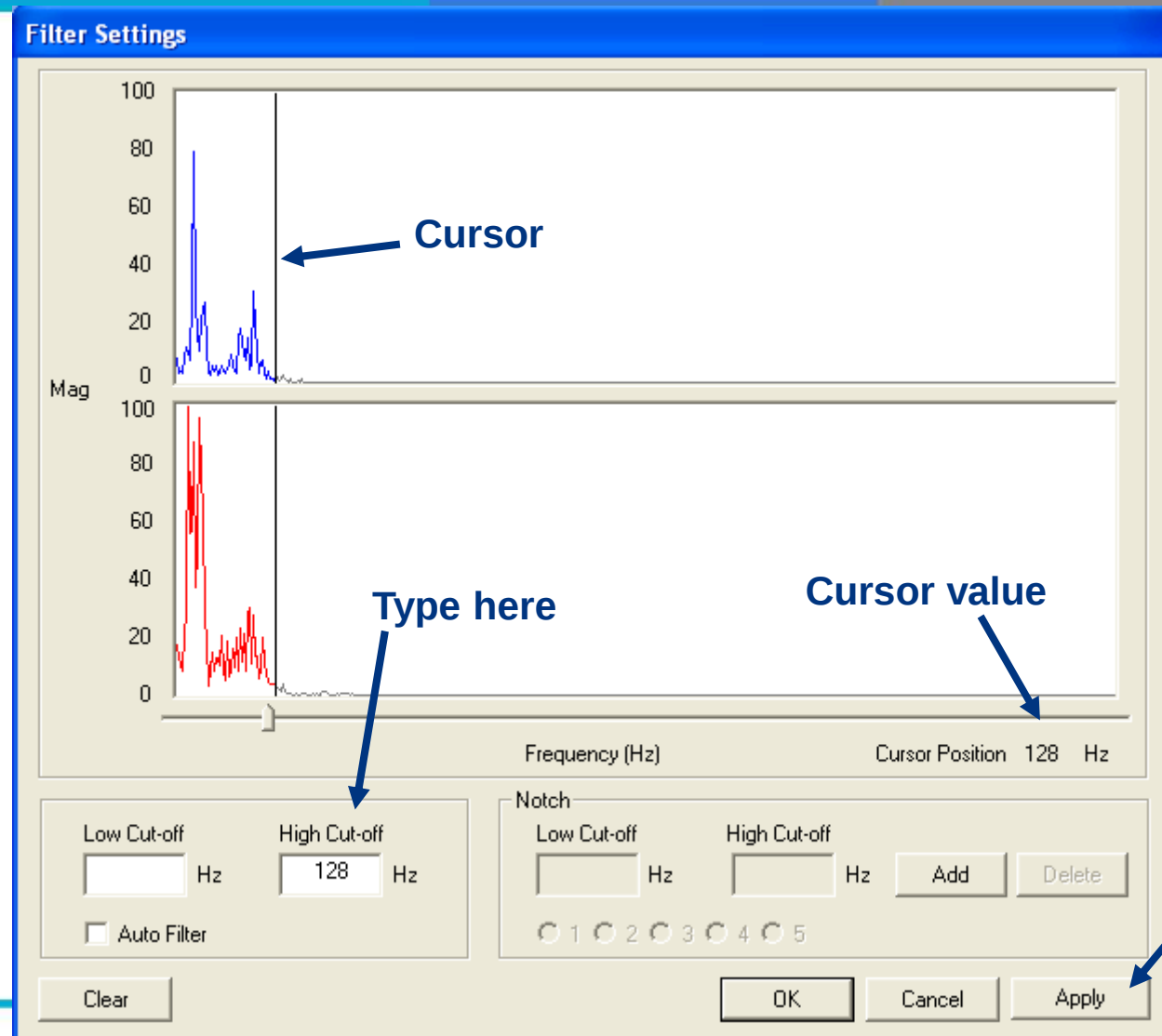
Click "Apply"

A HALMA COMPANY

High Cut Off



Halma Water Management



A high cut off is shown
set at 128Hz

Move cursor to view
cut off position

Type in high cut off
value

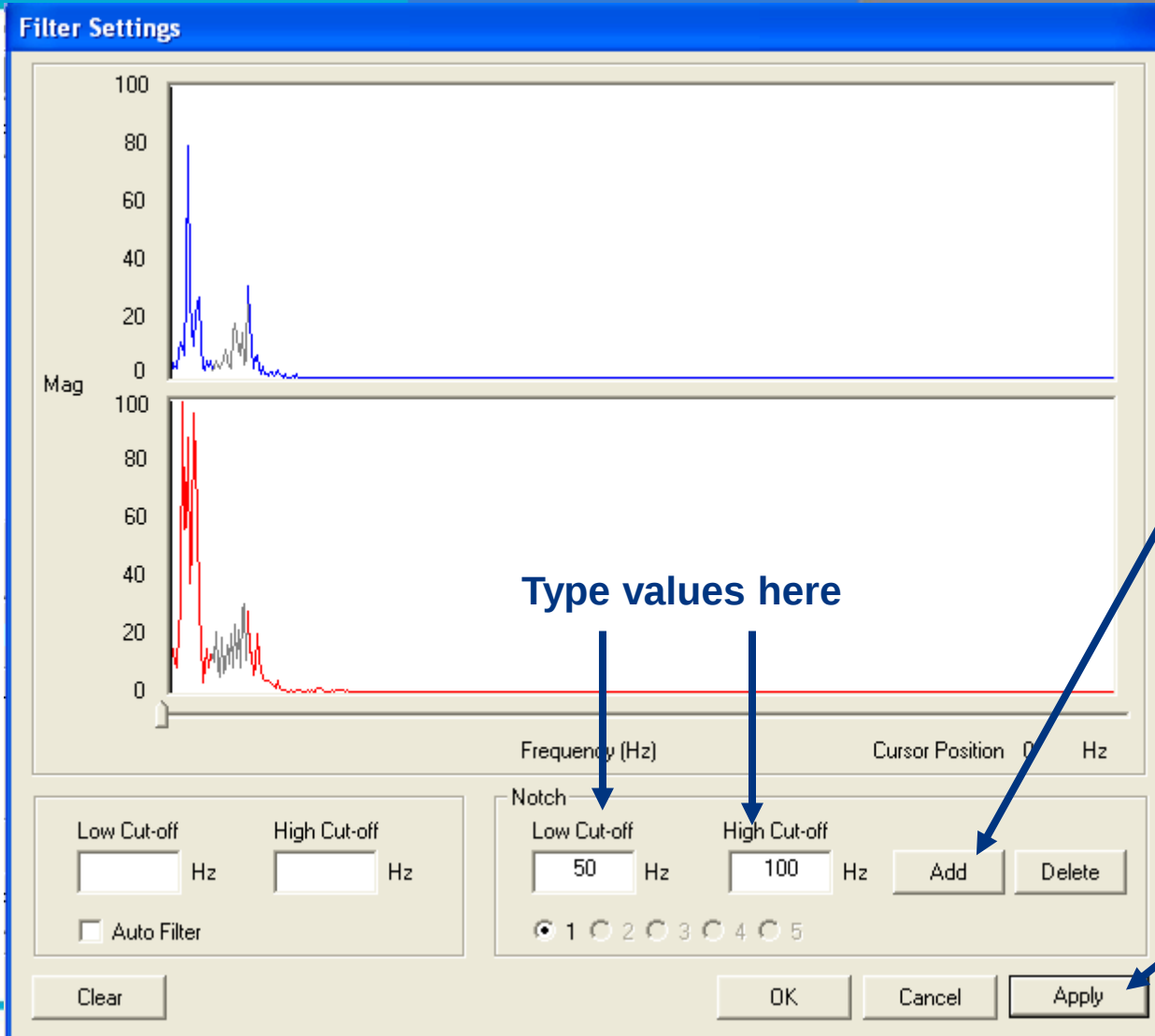
Click "Apply"

A HALMA COMPANY

Notch Filter



Halma Water Management



A notch filter is shown
set between 50Hz &
100Hz

Click "Add"

Type in low and high
cut off values for
the notch

Click "Apply"

A HALMA COMPANY

To Change Filters



Halma Water Management

A screenshot of a 'Filter Settings' dialog box. It has a 'Low' frequency field set to '50 Hz' and a 'High' frequency field set to '150 Hz'. Below these is a 'Pipe Material' field containing 'LDPE'. Underneath is a 'Presets' section with a list box showing 'Default', 'A', 'B', 'C', and 'D'. The 'D' option is highlighted in blue. To the right of the list box are three arrow buttons: an up arrow, a middle button, and a down arrow. A blue arrow points from the text 'Use the down arrow key...' to the down arrow button.

When selecting a plastic pipe, options A to J appear under the “Pre-sets” heading.

Use the down arrow key to quickly scroll through varying low frequency pre-set plastic filter settings.

This option is only on plastic pipes

Peak Suppression

Peak Suppression



Halma Water Management

DigiCALL

File Edit View Options Settings Mode Advanced Features Help

Correlation Result

Move cursor to start point → ← Move cursor to end point

55.2 m 44.8 m

Interface Unit Status

Peak Suppression

Set End Point Remove

Filter Settings

Low 50 Hz High 150 Hz

Pipe Material LDPE

Presets D

Correlation Information

Time Delay 0.0449 s

SNR 6:1

Elapsed Time 00:00:10

Processing

File Name

Correlation

START

Ready

Press "Set Start Point" then "Set End Point"

A COMPANY

Peak Suppression



Halma Water Management

DigiCALL

File Edit View Options Settings Mode Advanced Features Help

Correlation Result

Suppressed area

65.3 m 34.7 m

Interface Unit Status

Peak Suppression

Set Start Point Remove

Filter Settings

Low 50 Hz High 150 Hz

Pipe Material LDPE

Presets D

Correlation Information

Time Delay 0.1333 s

SNR 3:1

Elapsed Time 00:00:10

Processing

File Name

Correlation

START

Ready

HALMA COMPANY

Press "Remove" to put suppressed back into correlation

Calculating Velocity

Why do a Velocity Check ?



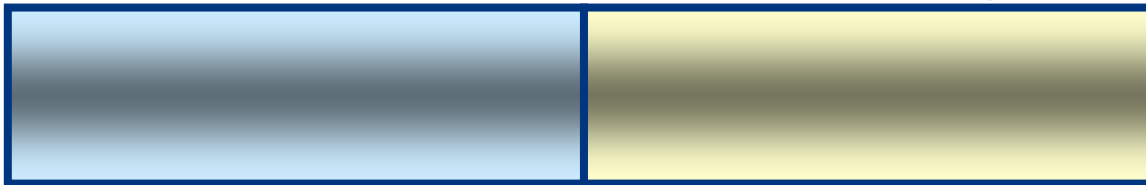
Halma Water Management

Problems

Assumed velocity for each section will be accurate.

Ideal pipework

Overall result good



Problem pipework



Assumed velocity for iron section may be inaccurate.

Velocity of iron section may be difficult to measure.

Overall result may be poor.

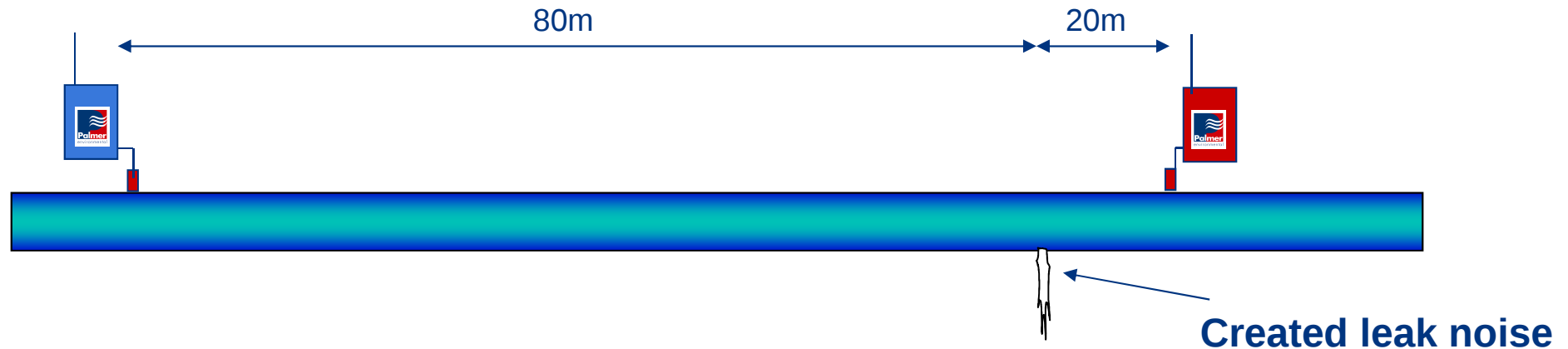
Velocity Formula

$$V = \frac{D - 2L}{T_d} \text{ m/ms}$$

L = Leak position (m) V = Velocity of sound along pipe (m/ms)

D = Length of pipe (m) Td = time delay (ms)

Calculating In Bracket



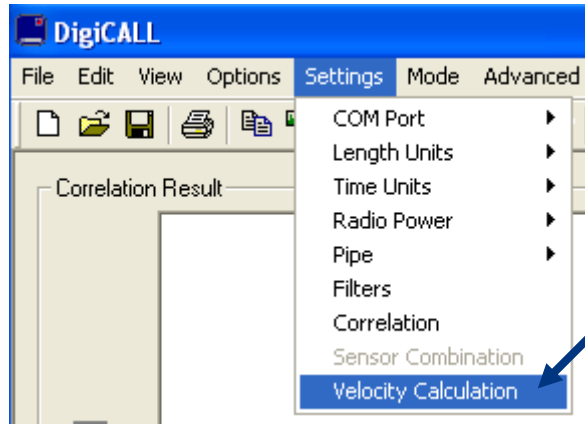
Create a leak between sensors

Start Correlation (using usual data input)

Stop Correlation

Remember : More accurate velocity is calculated when the leak created is closer to one of the sensors over a reasonable length

Calculating In Bracket



Select "Velocity Calculation"

The 'Velocity Calculation' dialog box is shown. It has a title bar with a close button. The main area contains the text 'Please enter the total pipe length' followed by a text input field containing the value '36.5' and the unit 'm'. At the bottom of the dialog, there are three buttons: '< Back', 'Next >', and 'Cancel'. An arrow points from the 'Next >' button towards the text 'Enter pipe length between sensors and click "Next"' on the left.

Enter pipe length between sensors and click "Next"

Calculating In Bracket

Velocity Calculation [X]

Is the known leak between the sensors?

☒ Yes
☐ No

Enter the distance between the leak and

m



< Back Next > Cancel

**Select “Yes” and
enter the distance
of the leak from the
Red sensor and
click “Next”**

Calculating In Bracket

Velocity Calculation [X]

The calculated velocity is:

m/ms

☐ Check to store the velocity

Enter a diameter for the pipe

mm

Select the pipe material

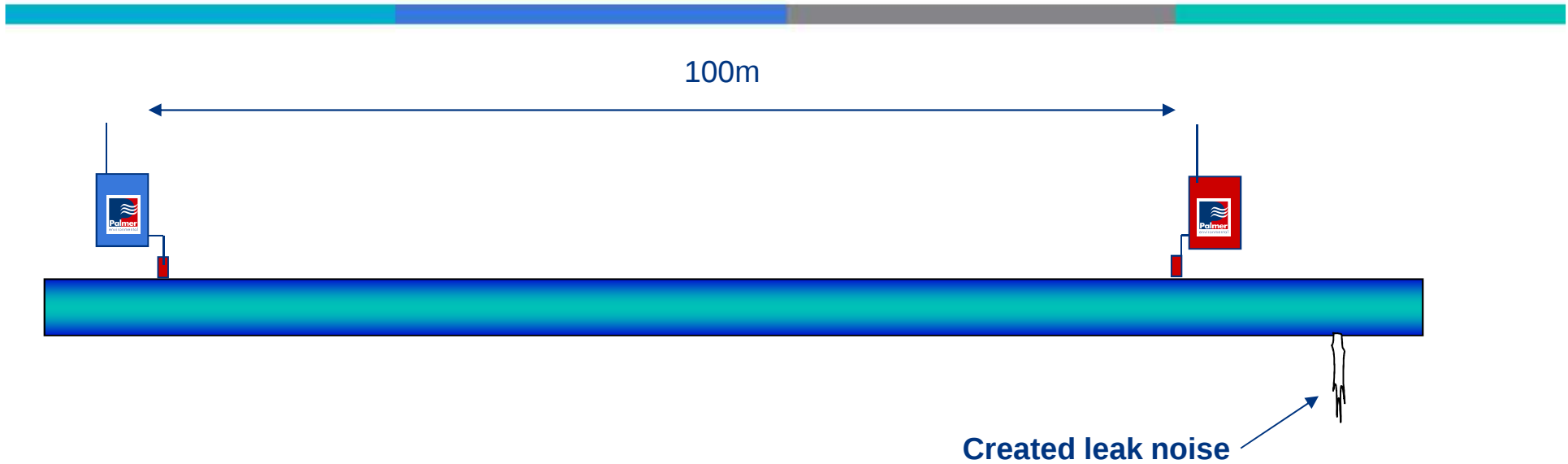
< Back Finish Cancel

The calculated
velocity is displayed

Calculating Out Bracket



Halma Water Management

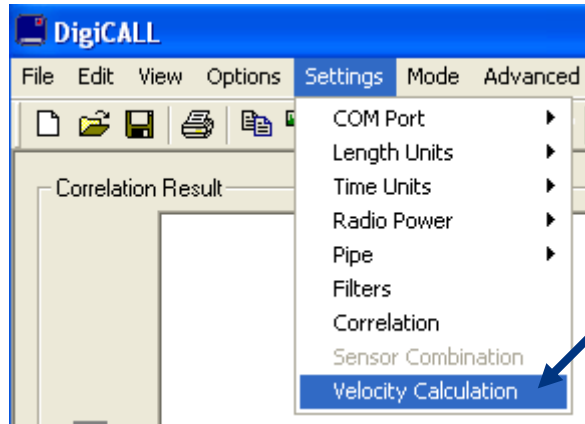


Create leak outside of either sensor

Start Correlation (using usual data input)

Stop Correlation

Calculating Out Bracket



Select "Velocity Calculation"

The 'Velocity Calculation' dialog box is shown. It contains the text 'Please enter the total pipe length' above a text input field. The input field contains the number '28.3' followed by the unit 'm'. At the bottom of the dialog, there are three buttons: '< Back', 'Next >', and 'Cancel'. The 'Next >' button is highlighted.

Enter pipe length between sensors and click "Next"

Calculating Out Bracket

Velocity Calculation 

Is the known leak between the sensors?

☐ Yes

☒ No

Enter the distance between the leak and

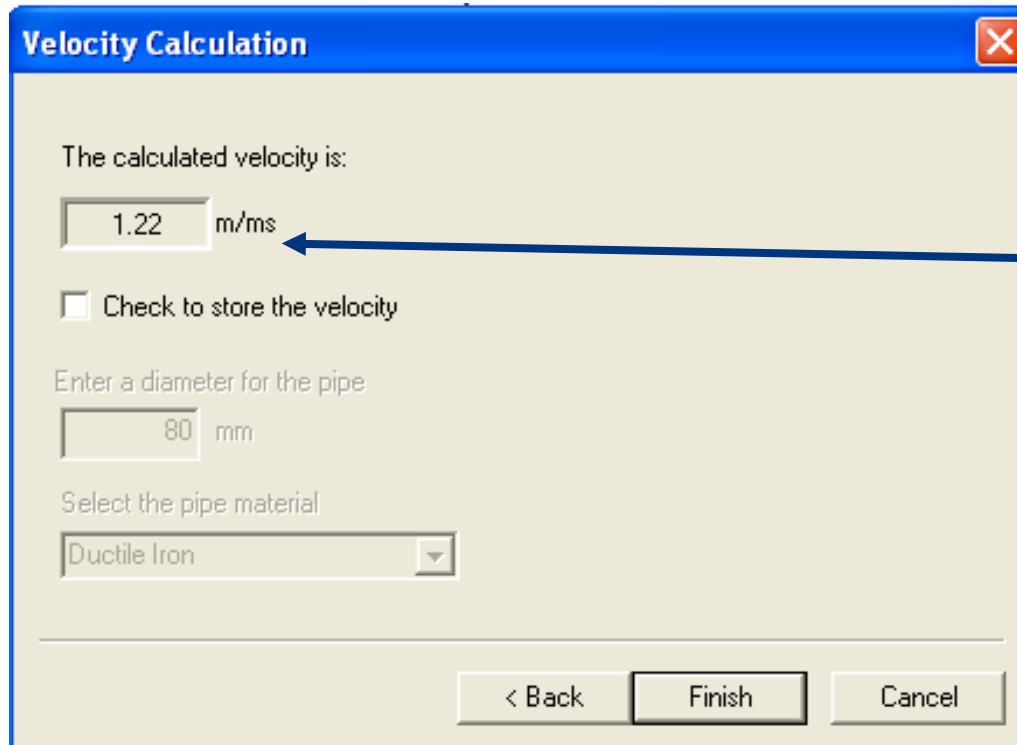
m





Select “No” and
click “Next”

Calculating Out Bracket



The dialog box titled "Velocity Calculation" has a blue header bar with a close button (X) on the right. The main area is light beige. It contains the text "The calculated velocity is:" followed by a text box containing "1.22" and the unit "m/ms". Below this is a checkbox labeled "Check to store the velocity" which is unchecked. Further down is the text "Enter a diameter for the pipe" followed by a text box containing "80" and the unit "mm". Below that is the text "Select the pipe material" followed by a dropdown menu showing "Ductile Iron". At the bottom are three buttons: "< Back", "Finish", and "Cancel".

Velocity Calculation

The calculated velocity is:

1.22 m/ms

☐ Check to store the velocity

Enter a diameter for the pipe

80 mm

Select the pipe material

Ductile Iron

< Back Finish Cancel

**The calculated
velocity is displayed**

Velocity Results

If velocity results fall into the figures below they can give an indication of material type :-

Iron	1.35
Steel	1.30
Copper	1.20
Lead	1.10
Asbestos Cement	1.10
PVC	0.50
Polythene	0.20

Post Processing

Post Processing

Providing the correlation was saved, enables the user to changes certain parameters at a later date like :-

Pipe material

Pipe diameter

Distance

Velocity

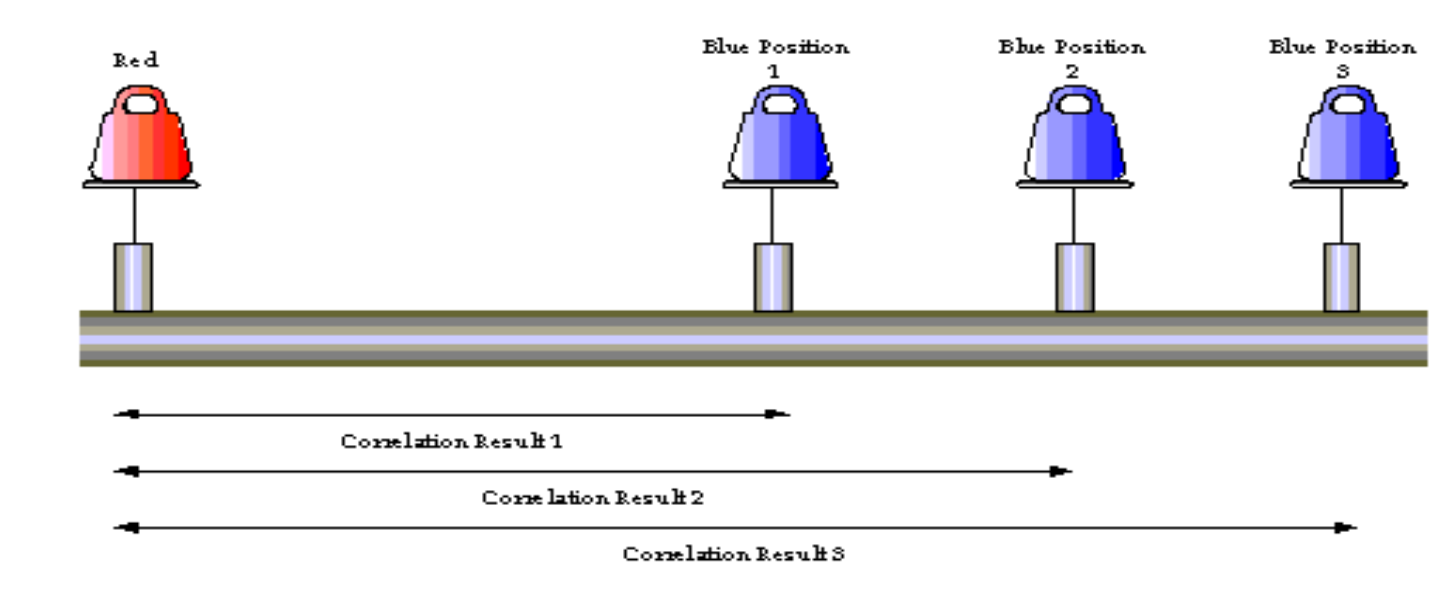
Filters

Regression Analysis

Regression Analysis



Halma Water Management



Leave one sensor static and undertake minimum of 3 correlations at different distances, saving each as a separate file.

Measures time delay against distance.

Regression Analysis

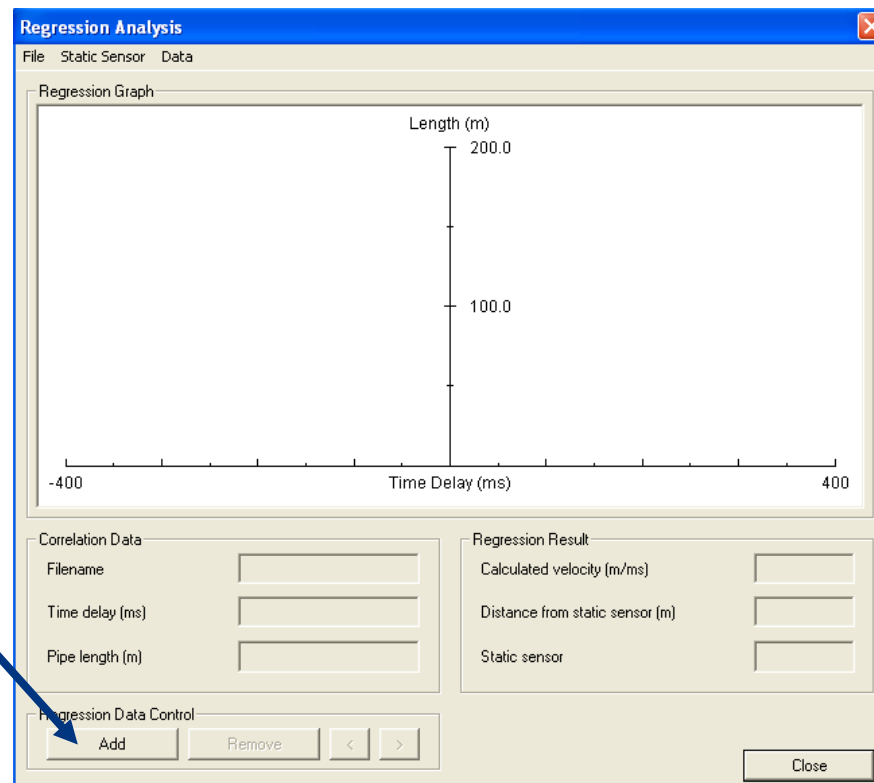


Halma Water Management



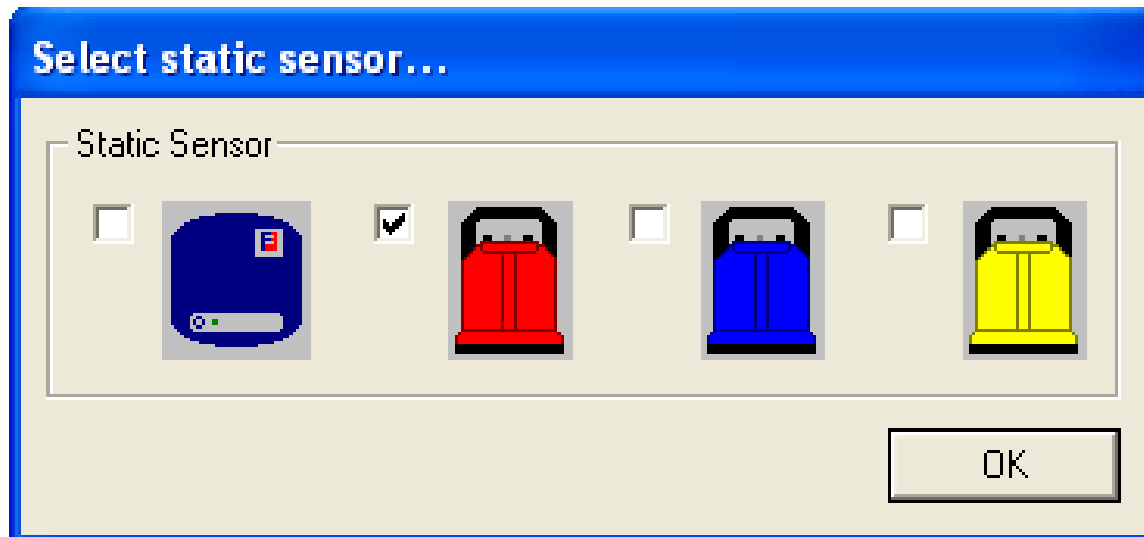
Select “Regression Analysis”

Select “Add” and select the first correlation previously saved and click “Open”



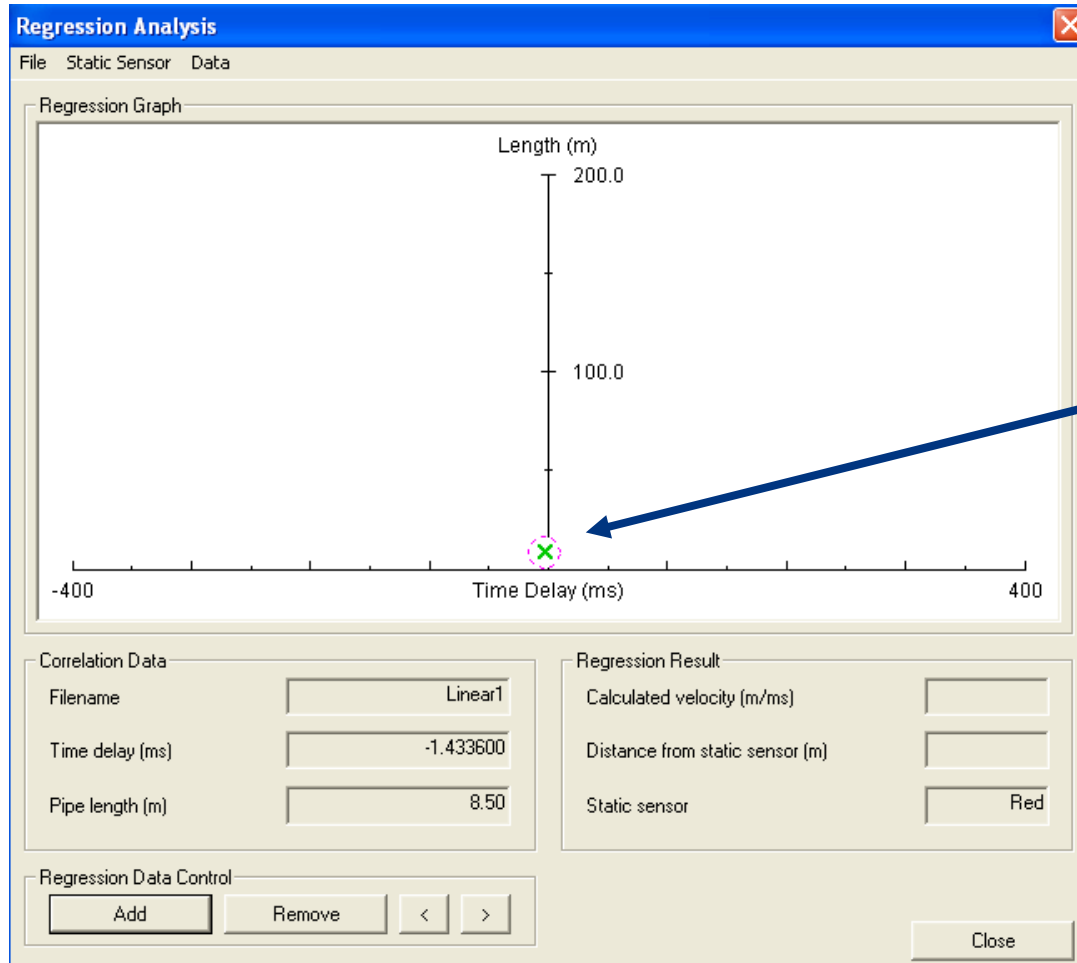
A HALMA COMPANY

Regression Analysis



Select the static sensor for your test, the one which remained in the same place throughout. Click “Ok”

Regression Analysis

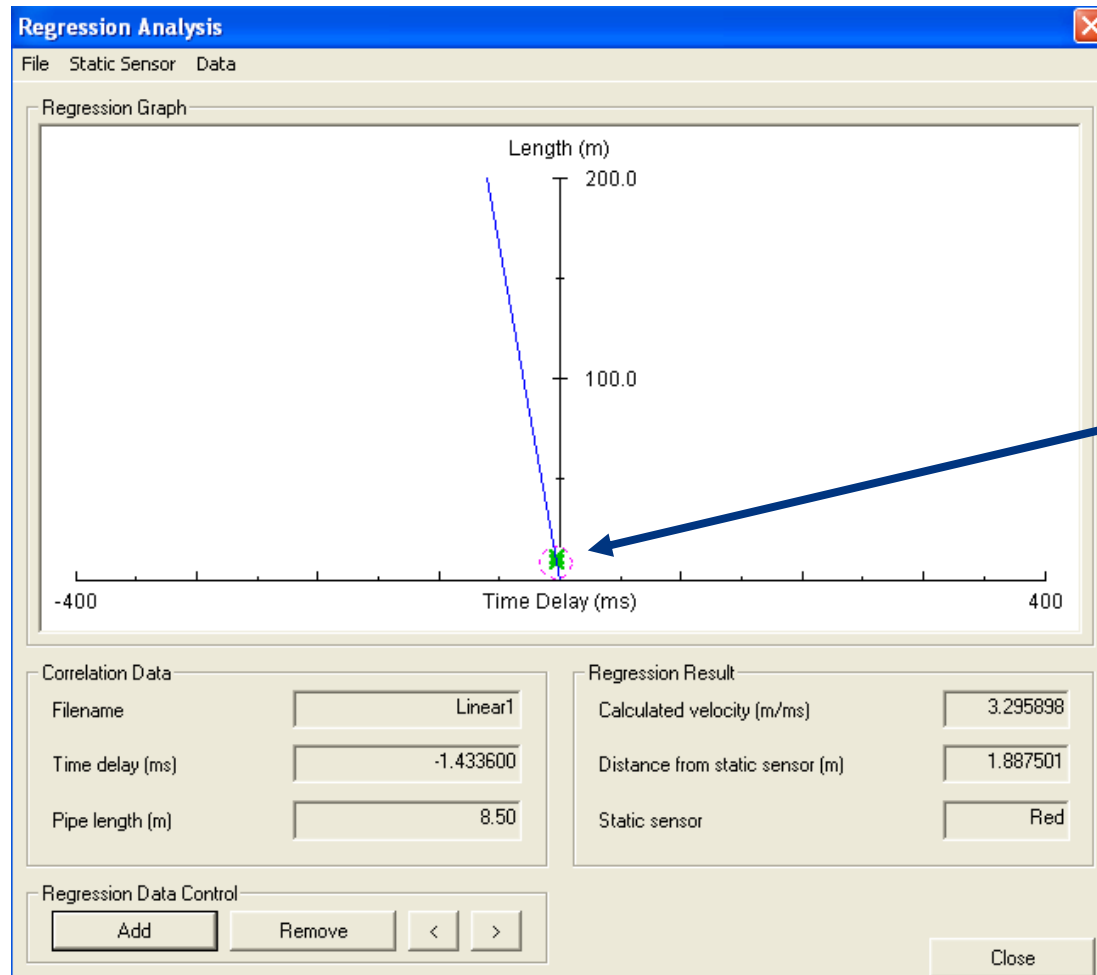


The 1st result is plotted, click “Add” and select the 2nd file saved to be plotted

Regression Analysis

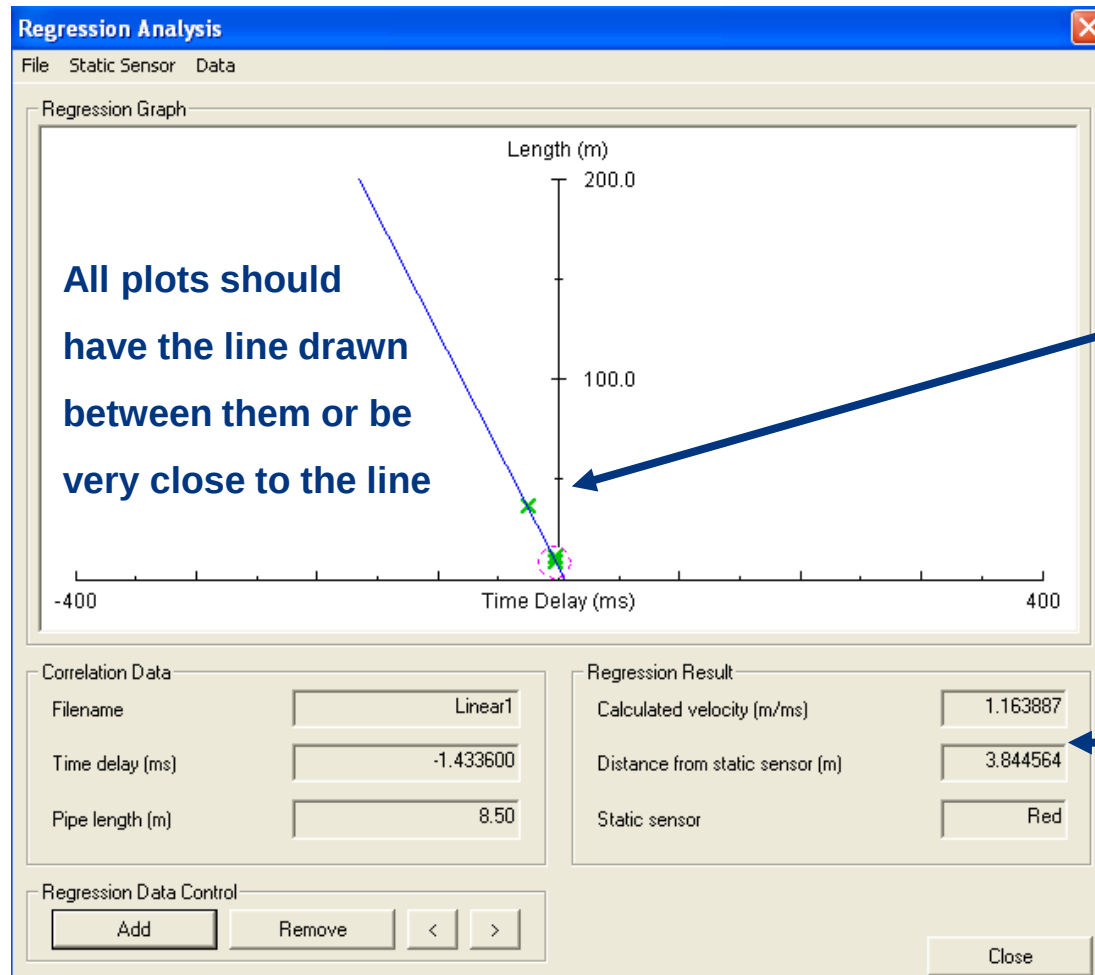


Halma Water Management



The 2nd result is plotted, click “Add” and select the 3rd file saved to be plotted

Regression Analysis



All plots should
have the line drawn
between them or be
very close to the line

The 3rd result is
plotted

The end correlation
result and calculated
velocity are shown
here

Three Station Correlation

Three Station Correlation

Why use 3 outstations ?

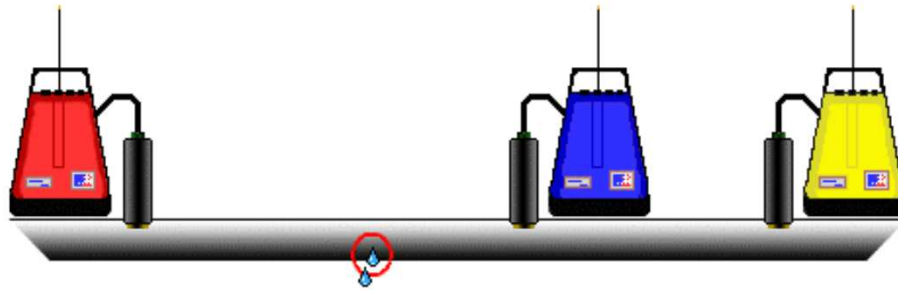
- Obtain 3 correlations in a single site visit
- More correlations = More confident result
- Automatic out of bracket velocity check
- Don't need to know pipe diameter

Only Rule

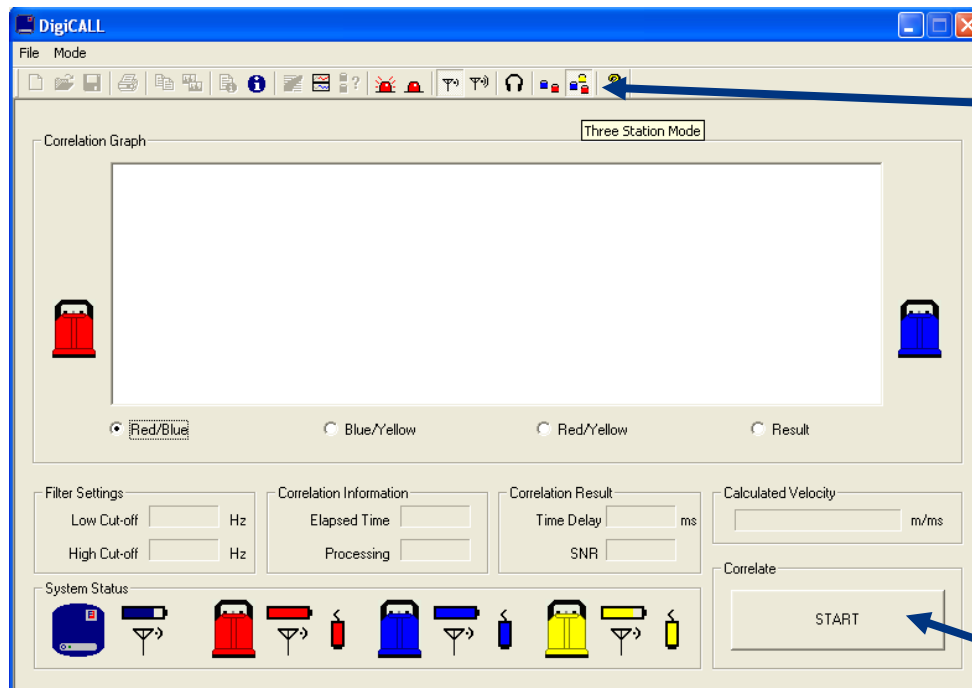
The outstations must be used in the same order every time from left to right, Red, Blue Yellow.

Can't be used on a "T" section of pipe

Three Station Correlation



Remember to have
blue in the middle



Click on “Three Station
Mode”

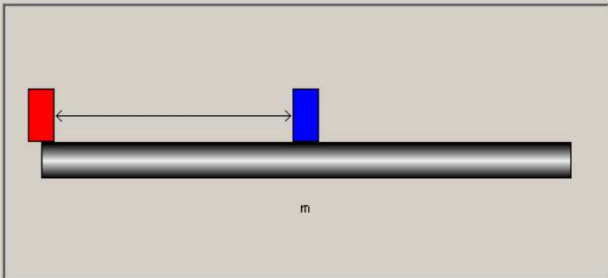
Slightly different
correlation screen
appears

Click “Start”

Three Station Correlation

Three-station Setup Page 1

Enter the distance between the red and blue sensors:



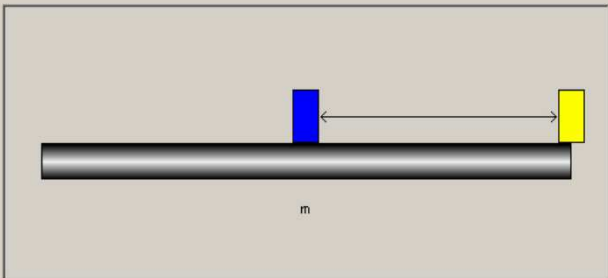
Distance (m)

< Back Next > Cancel

Prompts for distance between
red and blue, enter and click “Next”

Three-station Setup Page 2

Enter the distance between the blue and yellow sensors:



Distance (m)

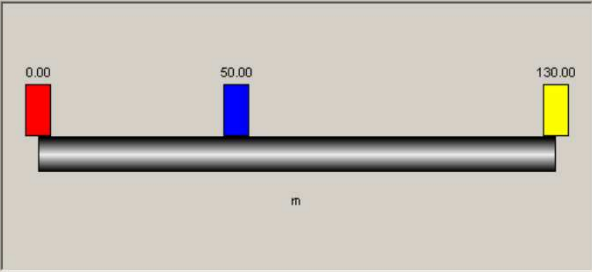
< Back Next > Cancel

Prompts for distance between
blue and yellow, enter and click “Next”

Three Station Correlation

Three-station Setup Page 3

Confirm that entered data is correct:



0.00 50.00 130.00

m

< Back Next > Cancel

Shows a summary of distances,
click “Next”

Three-station Setup Page 4

Select filters for pipe material:

Material name:

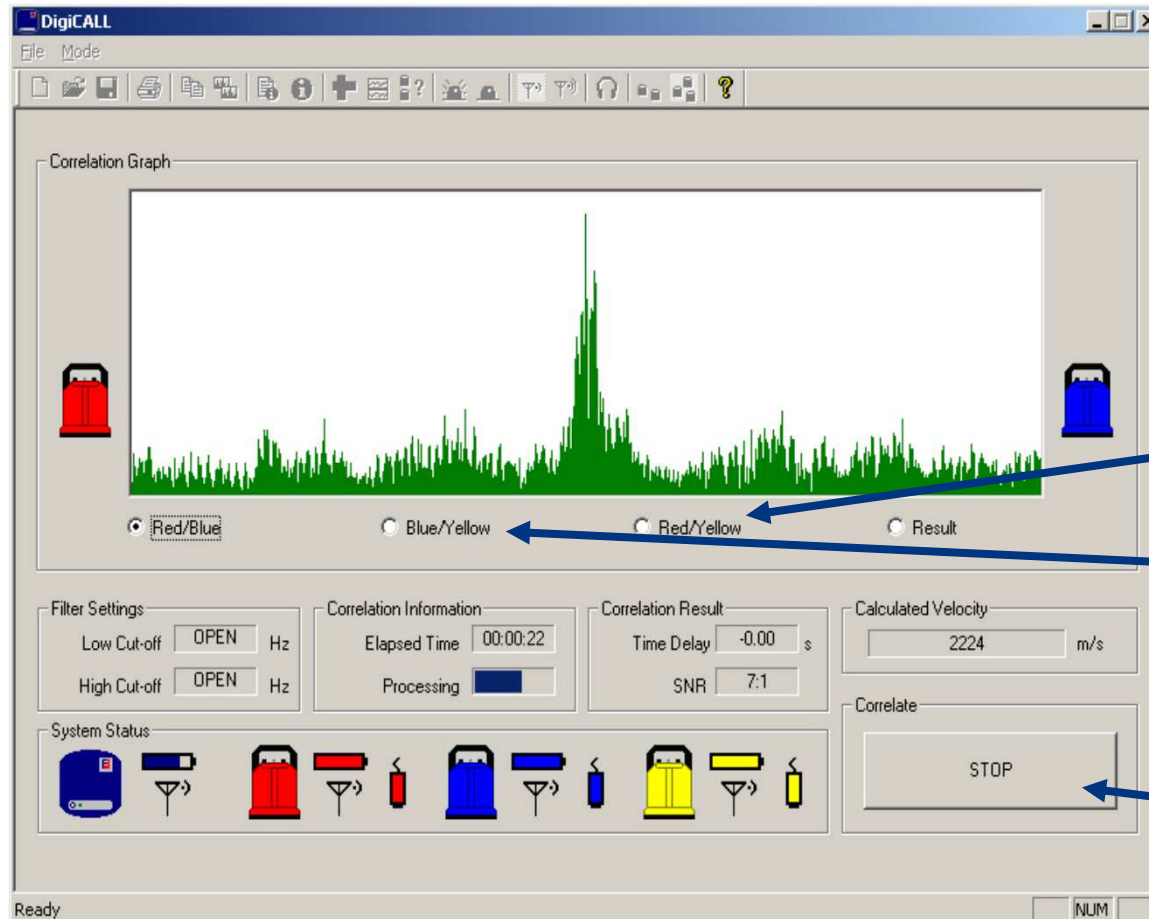
Default low cut off (Hz):

Default high cutoff (Hz):

< Back Finish Cancel

Enter the material name for the chosen
filter range to use, click “Finish” and
correlation will begin

Three Station Correlation



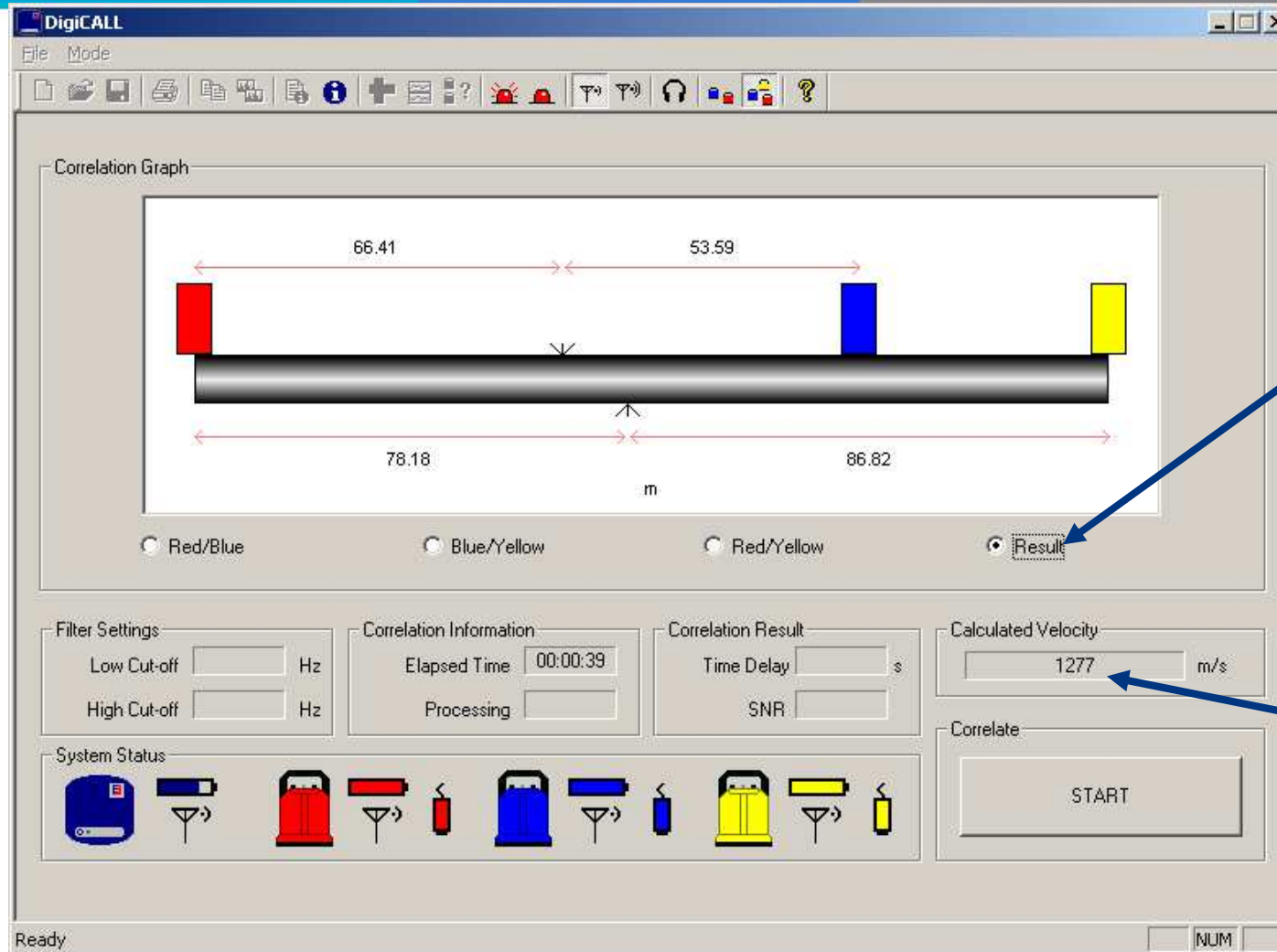
Correlations will appear, to view click on the different sensor combinations.

Once a good peak has established on all click "Stop"

Three Station Correlation



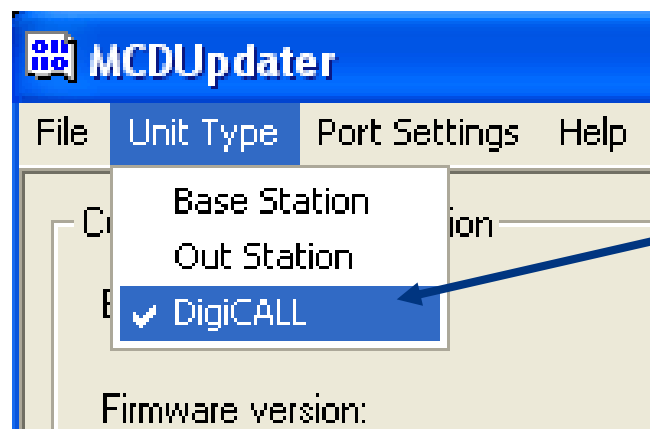
Halma Water Management



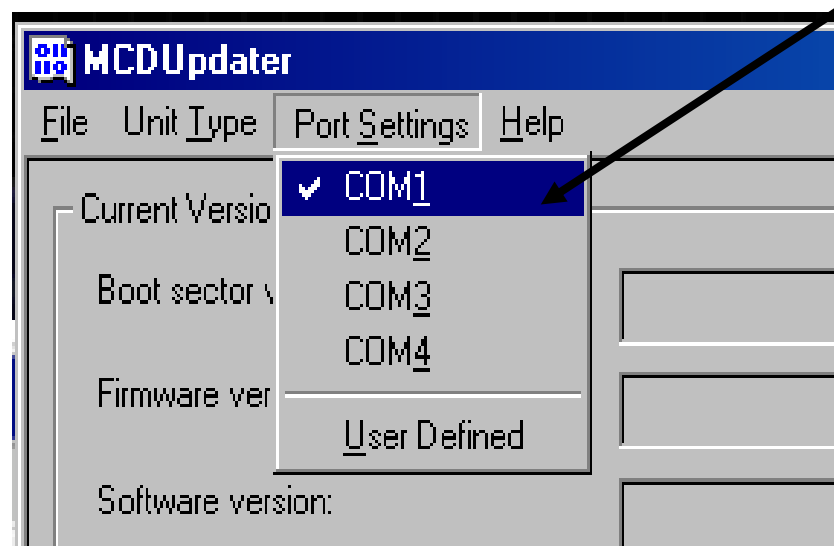
Click "Result"
to view leak
positions

Calculated
velocity

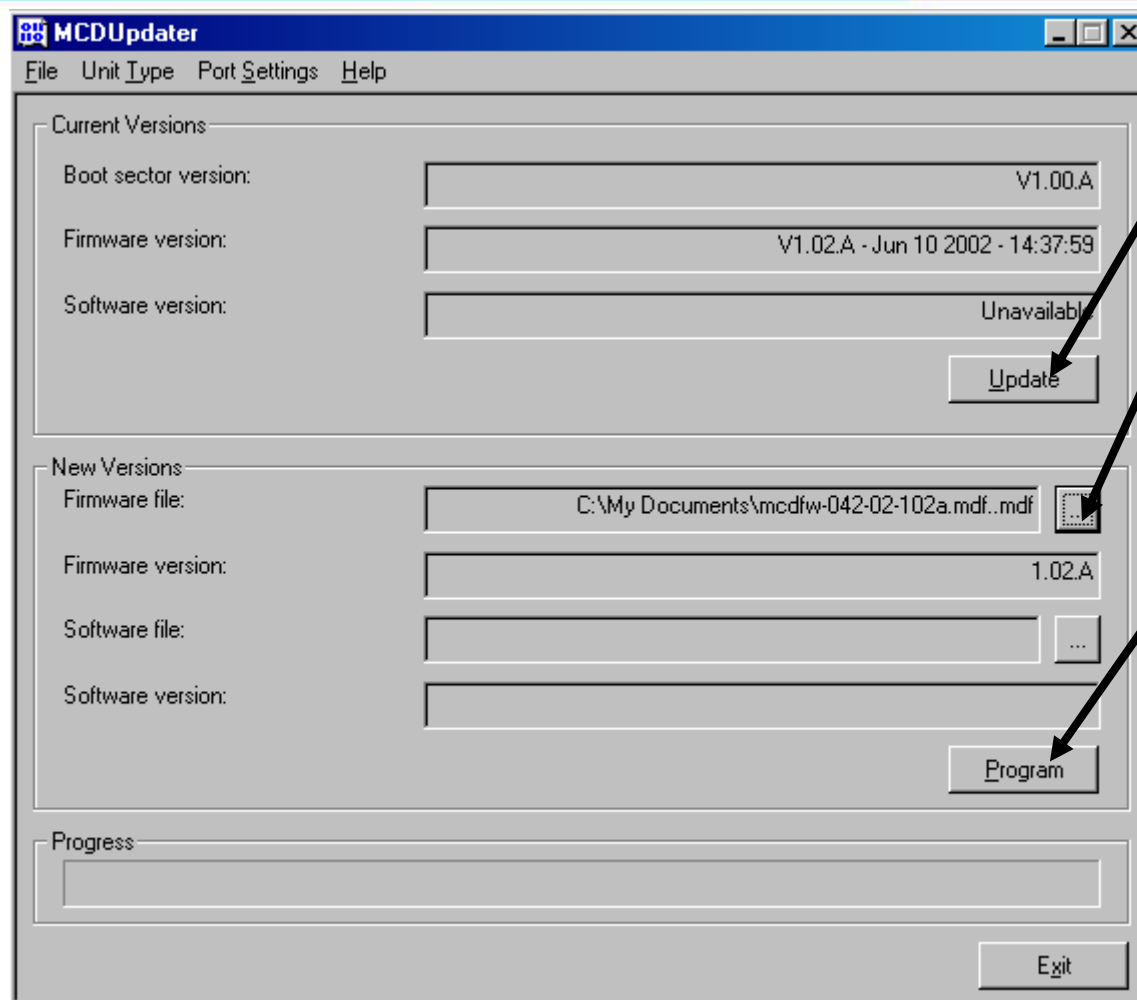
A HALMA COMPANY



Select DigiCALL for interface unit



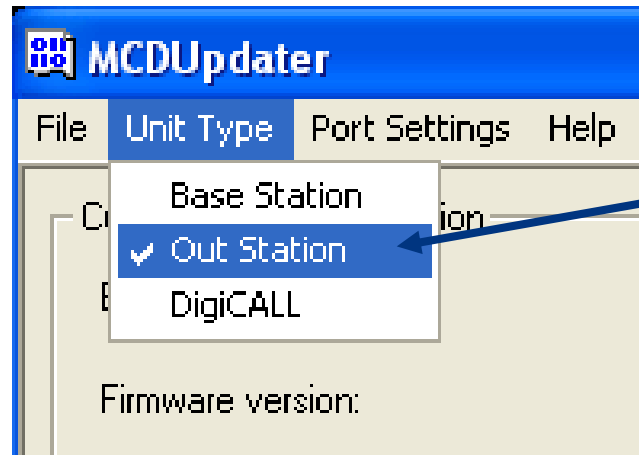
Select correct Comm Port



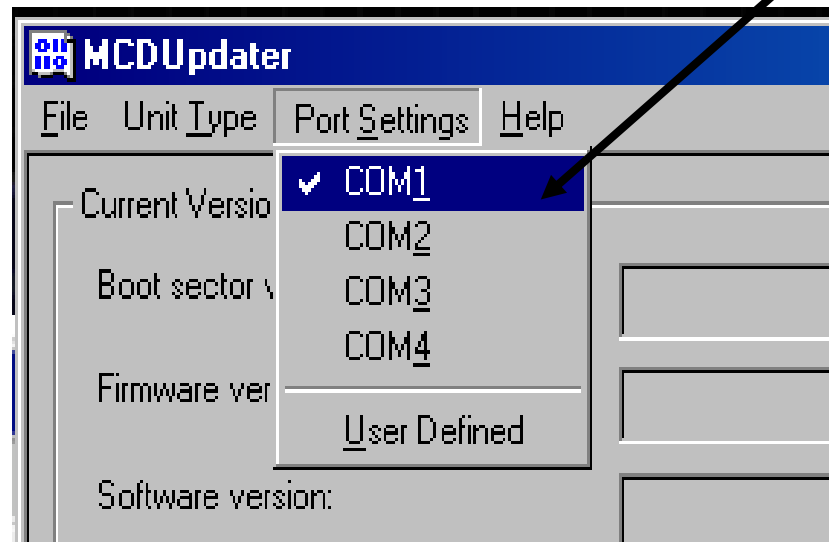
Select Update for current version

Browse for new firmware version
and select file (from web site)

Select Program

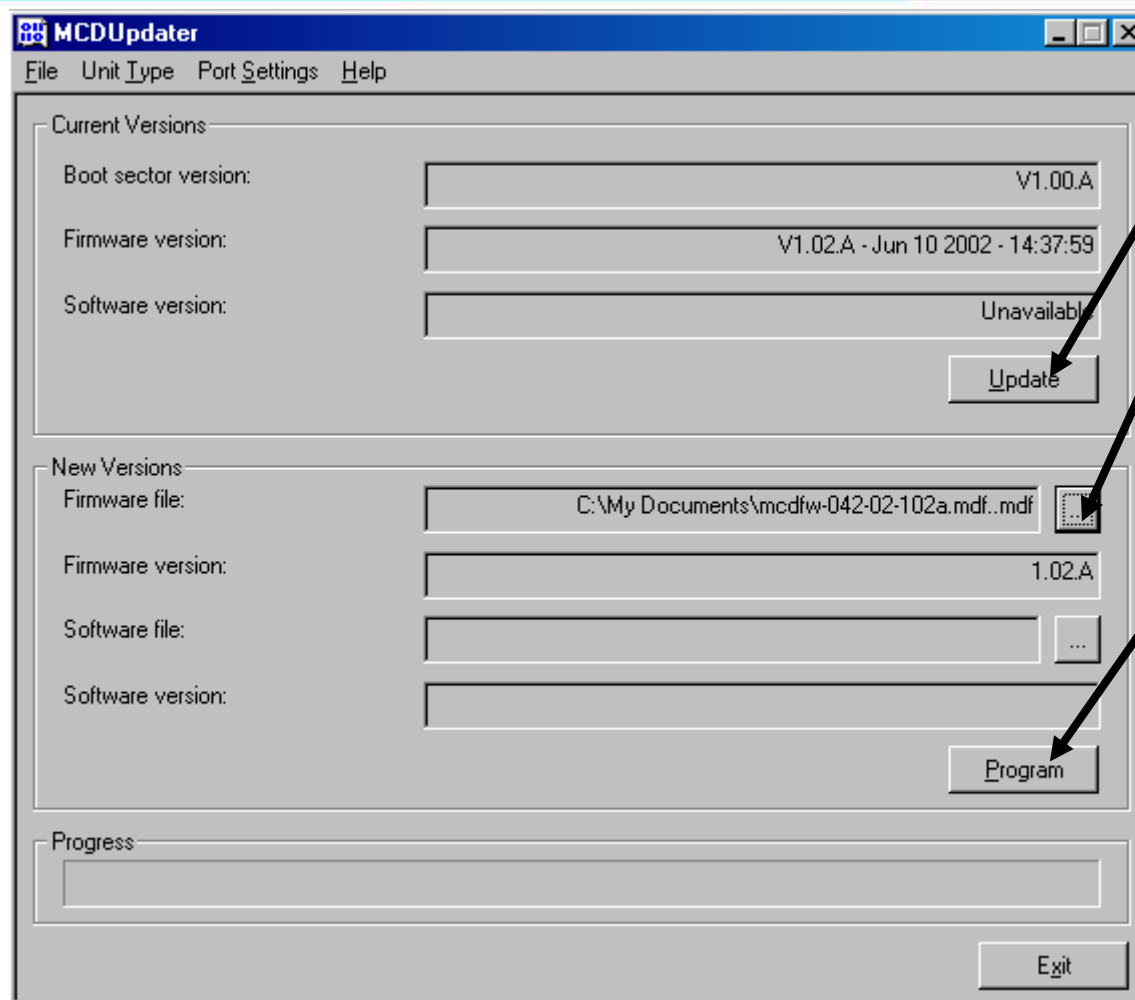


Select Out Station



Select correct Comm Port

Note :- Remember to do both Red & Blue outstations and Yellow where applicable



Select Update for current version

Browse for new firmware version
and select file (from web site)

Select Program

Sources of Error

Remember the GOLDEN RULE

Rubbish In = Rubbish Out

**The more human error cut out the
better the possibility of a good result**

Sources of Error



Halma Water Management

- **Poor Measurement**
- **Wrong Material**
- **Wrong Pipe Diameter**
- **Parallel Mains (Correlating Different Mains)**
- **Mixed Materials**
- **Tee Connections**
- **Poor Sensor Contact**

A correlator is not a “Magic Box” that will find every leak, noise must be detected at both sensors for a correlation to be good.

That’s science !!

Tip.....

Never dig on a correlation peak until confirming with ground sounding.